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PREFACE

Welcome in 2nd Planocosmo International Conference, a biannual event in Urban and Regional Planning of ITB.

We have witnessed how cities and regions are expanding as logical consequence to rapid economic growth. On the other hand, inadequate or poorly performing infrastructure presents major economic and social challenges, reflected by widening regional disparity and exacerbating poverty. Furthermore, the role of infrastructure is no longer limited to addressing economic and social needs. Network-oriented infrastructure development and climate-friendly technology adoption have become an immediate necessity in providing the proper framework towards sustainable and inclusive development. Herein, the role of planning is challenged more than ever. The lack of funding and scarce resources, conflicting interests among various stakeholders, and other external factors including political, governmental, and societal system are among the key issues that hinder the acceleration of infrastructure provision. Accordingly, in this conference, researchers and practitioners will discuss the interface between infrastructure and regional planning and its implementation for inclusive development.

The discussion of the workshop’s theme will be organized into four tracks, which comprise Infrastructure and Regional Development; Infrastructure and Poverty Alleviation; Infrastructure and the Environment; and Infrastructure and The Financing Options. Sixty papers were accepted and will be presented in these sessions. The first track, Inclusive Infrastructure for Regional Development, will discuss various challenges to provide inclusive infrastructure for regional development. The second track, Pro-poor Infrastructure Development, will discuss various issues related to implement pro-poor policies in infrastructure and regional development. The third track, Urban Environmental Planning, covers issues on infrastructure and regional development in dealing with sustainable development. The fourth track, New models in infrastructure financing, will discuss the alternative to finance the infrastructure development which is involve the private sectors and community. After all the sessions are concluded, we will continue with a session where each chair will report the discussions in each track. West Java Province Governor also invite us for keynote speech and a dinner at governor home office in this evening. You all are welcome to join this social event.

This 2nd Planocosmo International Conference is specially held as a tribute for Prof. Bambang Bintoro Soedjito. He was an academic staff of the Department of Regional and City Planning, School of Architecture, Planning, and Policy Development, Bandung Institute of Technology (ITB). He is currently working as Public-Private Partnership (PPP) Development Specialist in National Development Planning Agency (BAPPENAS), Government of Indonesia. His works have been focusing on policy planning and regional analysis, poverty alleviation, fiscal decentralization, resource economics and environmental management, integrated area development and PPP in infrastructure provision. This conference’s theme and tracks are specifically arranged reflecting his area of expertise, aimed at synthesizing the dynamic of planning framework occurring throughout the development process in Indonesia until now and lessons learned from abroad.
The execution of this workshop is indebted to the organizing committees who have been working hard to prepare the workshop, both substantially and technically. Thank you very much for your participation in this event.

Suhirman
Chair of Organizing Committee
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INFRASTRUCTURE DEVELOPMENT AND FINANCING OPTIONS: FROM CONCEPT TO IMPLEMENTATION

Bambang Bintoro Soedjito

Abstract

Investment in infrastructure provides meaningful contribution in accelerating economic growth, creating employment opportunity and alleviating poverty. Adequate and quality infrastructure will increase productivity, strengthen economic tenacity and eventually would reduce inter-regional welfare inequality and potential social conflict. During the monetary crisis, Indonesia basically terminated the entire infrastructure development programs due to budget constraint. Therefore, infrastructure development has become one of the priorities in the National Mid-Term Development Plan (RPJMN) of 2005 – 2009 and of 2010 – 2014. These obviously require large amount of fund.

The main challenge encountered is financial gaps between infrastructure investment needs and the government’s fiscal capacity. In addition, there is only about 2-3 % of GDP to allocate budget on infrastructure sectors. Hence, to bridge the gap between available public resources and the cost of needed infrastructure and services and to ensure that infrastructure and services are delivered as efficiently and cost-effectively as possible, the Government of Indonesia (the GOI) are increasingly turning to public-private partnerships (PPPs).

The public private partnership in infrastructure development has also become a necessity in decentralization era. However, even with a strong commitment by the government and valuable support from development partners in reforming the infrastructure sector and promoting private sector participation, the progress in implementing PPP projects is quite slow. These are due to four major issues, i.e. lack of Government support, the relative inexperience and low capacity of the government’s contracting agencies (GCAs), challenges in respect of land acquisition, as well as regulatory constraints and the lack of harmony in procurement regulations. Responding to these critical issues, the Government took a major step in refining the PPP regulatory framework to improve the attractiveness and competitiveness of the GOI’s PPP programme.

Most GCAs are reluctant to implement PPP, because PPPs are complex and relatively inflexible structures. And that PPP procurement and implementation can be lengthy and costly. The indicative timeline makes obvious that the processes of

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2 The author is professor of regional development planning at the School of Architecture, Planning and Policy Development, Bandung Institute of Technology. The author would like to thank Dr.Ridwan Sutriadi and his assistants, Handini and Rizqy Habibah, for their contribution in preparing this lecture.
PPP implementation from planning to contract signing need 26 to 34 months to complete. Moreover, the overall process of PPP implementation requires the carrying out of different procurement regulations. Considering the complexity of the procurement process in the implementation of PPP project, it is necessary to simplify the process by harmonizing the current various procurement regulations.

The ability to build infrastructure is a transformation and reformation continuous process. This ability also requires changes and adaptation continuously. Strong leadership - and the strategic vision - is needed to anticipate the changes and adjustments for such changes.

**Keyword:** development, financing, infrastructure, investment, PPP, procurement.

1. Introduction

In today’s global economy, the ability to deliver goods and services in a timely and cost-effective manner is critical. National and local governments and public authorities are constantly looking for ways to expand and modernize their public infrastructure and services.

Improved infrastructure and services are a necessary precondition for successful and sustainable economic growth and social development. Adequate and quality infrastructure will increase productivity, strengthen economic tenacity and in its process develop better quality of life. Moreover, infrastructure would eventually reduce inter-regional welfare inequality and potential social conflict.

Infrastructure problem encountered by Indonesia is very simple, i.e. inadequate provision. During the monetary crisis, Indonesia in essence ceased the infrastructure development programs due to budget constraint. The available budget did not even cover the cost for operation and maintenance of the existing infrastructures. One of the apparent consequences was that many roads are in poor condition and caused significant challenges for those who needed access to basic services, such as, medical and educational facilities as well as markets. This created larger burden for the poors. Moreover, the demand for infrastructure services continue to increase along with the growth of population, the economic recovery, and the increased of urbanization. Since the crisis, the demand for infrastructure has been recovering rapidly. At the same time the flow of new private investment in infrastructure has practically ceased. Deteriorating quality and increasing shortage in infrastructure is already creating significant impediments to growth and undermining the government’s poverty alleviation objective (Soedjito, 2006a).

Therefore, infrastructure development has become one of the priorities in the National Mid-Term Development Plan (RPJMN) of 2005 – 2009 and 2010 – 2014. Indonesia needs more road and bridge network, irrigation systems, power plants, ports, airports, clean water and sanitation system, railway infrastructures, as well as telecommunication infrastructures and facilities. These obviously require large amount of fund. In terms of non-commercial infrastructures, the government is obliged to provide them using national and/or local budget. However, the
government’s fiscal capacity is not sufficient to cover all the needs. In order to obtain new channels of fund, the Government, in the Infrastructure Summit in January 2005, had formally invited private sectors to participate in financing infrastructure projects which are commercially viable through public-private partnerships or PPP scheme. It was estimated that Indonesia will need approximately USD 22 billion annually within the next five to ten years for developing toll roads, power plants, airports, seaports, telecommunication network, clean water and sanitation.

Considering the amount of funds needed for infrastructure development, in January 2005, the government has conducted the first Infrastructure Summit. In this event government invited the private sector to participate in the provision of commercially viable infrastructure by way of PPP. For Indonesia actually private sector participation in public infrastructure provision is not a new thing. Over past years, this had been applied in many sectors –toll roads, water supply, power generations, and telecommunications. The experience provided Indonesia with valuable lessons in what works and what doesn’t, and how deals should be structured to ensure the best outcomes for the community. There is no point in reinventing the wheel. Consequently, the Government of Indonesia has embarked on an extensive agenda for private sector involvement in the provision of public infrastructure. This led to the issuance of Perpres 67/2005 (Presidential Regulation on the cross-sector PPP regulatory framework) and PMK 38/2006 (Ministry of Finance’s Regulation on the risk management framework), both paving the way for a more conducive, effective environment for private sector participation (PSP) in infrastructure.

However, even with a strong commitment by the government and valuable support from development partners in reforming the infrastructure sector and promoting private sector participation, the progress in implementing PPP projects is quite slow. Based on our evaluation, there are four major issues impeding the development and financing of PPP transactions. First, the issue of Government Support (direct and contingent) is repeatedly identified by investors and project financiers as the most critical issue impacting their ability and willingness to participate in Indonesia’s PPP transactions. Second, the relative inexperience and low capacity of the government’s contracting agencies (GCAs) in understanding of PPP and of the PPP procurement process, resulting in poor quality of project preparation entering PPP project pipeline. Third, challenges in respect of land acquisition to implement PPP transactions. Land acquisition has also been identified as a critical impediment to the PPP procurement process. And fourth, regulatory constraints – either sectoral or, more broadly, impacting PPP development – and the lack of harmony in procurement regulations.

Responding to these critical issues, the Government took a major step in refining the PPP regulatory framework to improve the attractiveness and competitiveness of the GOI’s PPP programme. To provide greater clarity and certainty for investors, the Government issued Perpres 13/2010 and Perpres 56/2011 as amendments to Perpres 67/2005 which specifically contemplates direct (fiscal and non-fiscal) government support, including land acquisition, and government guarantee (contingent support). In this regard, Ministry of Finance (MOF) initiated presidential regulation (Perpres 78/2010) and Ministry Regulation (PMK 260/2010) replacing PMK 38/2006 to provide a more coherent, comprehensive and effective government guarantee. Under
this Perpres, the IIGF (Indonesia Infrastructure Guarantee Fund) or PT PII established in December 2009 will provide government guarantees or credit enhancements only to financially feasible PPP projects. With respect to fiscal support, MOF is also developing a framework for the establishment of a viability gap fund (VGF) by enacted PMK 223/2012. The VGF is designed to enhance the financial feasibility of those PPP projects which are economically feasible but marginally financially viable, e.g. support for part of the construction (Soedjito, 2011).

Moreover, the government has also established IIFF (Indonesia Infrastructure Financing Facility) or PT SMI. IIFF is expected to play two important roles: first, as a catalyst role in terms of co-financing with commercial lenders to provide longer term debt; and second as a pioneering role in the sense of taking risks on projects that commercial lenders are less willing to assume. Meanwhile the Center for Government Investment (PIP) is expected to provide pre-financing for land acquisition. And with the enactment of Law 2/2012 on land acquisition for development projects serving the public interest and its implementing regulations are expected to accelerate land acquisition for infrastructure development.

In 2011 Indonesia with the prospect of encouraging long-term growth, the government of Indonesia initiated a new development vision for the year 2025, with the objectives of increasing people’s welfare and reducing poverty. This was the basis for launching of a master plan for the acceleration and expansion of Indonesia’s economic development (MP3EI 2011-2025) promulgated under Perpres 32/2011. Under MP3EI six economic corridors are identified and for the development of these six corridors, the needed investment in infrastructure is estimated around 641 to 1,072 billion US dollars (MP3EI Document, 2011). These investment figures once again shows the need to mobilize non-government (including state owned enterprises, private sector, PPP) are huge. In the context of MP3EI, the government instigated a blue print for the development of national logistic system to create strong Indonesia’s competitiveness stipulated under Perpres 26/2012.

From brief explanation above, it is clear that issues of inadequate infrastructure presents major economic and social challenges that governments and businesses need to address. Government well recognizes that the development of the country will be largely depend on the physical infrastructure require to support the economy and improve prosperity (Soedjito, 1995), while the size of the infrastructure gap and concerns about how to find the money to fill it are the key of current debate on this issue. The size of infrastructure “gap” need to be funded sufficiently to get more, better quality infrastructure. To achieve this, government with the private sector should collaborate to select, design, deliver and manage infrastructure projects, and make more out of infrastructure already in place.

This paper aims at reviewing the evolution and challenges of PPP implementation as one of the financing options of infrastructures. It consists of eight parts. Following the introduction, the second part describes the evolving development policies and strategies; proceeded by discussion on the evolving infrastructure specific development policy and strategy. The fourth part examines the financing needs for infrastructure; continued by assessment on private sector participation in
infrastructure provision and services. The next part reviews the conflicting perspectives of decentralization, while part seven focuses on the need for harmonizing the procurement regulations. And finally, the last part attempts to provide summary and conclusions.

2. The Evolving Development Policies and Strategies

Over the thirty years between 1967-1997 under the New Order government, Indonesia experienced a remarkable seven percent averaged GDP growth rate and 4.4 percent averaged per capita income growth rate, while the incomes of the bottom 20 percent income distribution also increased by the same pace as overall income (Timmer, 2004). Moreover, the structure of the economy experienced rapid change shifting toward a more diversified economy away from agriculture. At the same time, poverty declined from over 60 percent of the population in 1965 to 11 percent in 1996 and accompanied by impressive progress in a wide range of human development indicators.

This rapid growth was built on a systematic and pragmatic approach utilizing the key planning tools, i.e. the long-term (PJP), medium-term (Repelita) plans and the annual budget within the framework of three development pillars: growth, equity and stability. This further translated into an operational strategy focusing on sound macroeconomic policies, heavy investments in infrastructure and education and health, support for agriculture and increasingly liberal trade and foreign investment policies as well as structural reforms in industrial and financial sectors. Macroeconomic policy was managed to maximize overall rate of economic growth, subject to controlling inflation through fiscal and monetary discipline.

During 1970s, Indonesia experienced rapid growth of income, consumption and investment financed by windfall revenues from oil exports. This windfall generated current account surpluses and increased budgetary revenues allowing large investments in infrastructure, education and health as well as in agriculture and industrial activities. The investments in infrastructure and agriculture played a key role in preventing its agriculture and manufacturing sectors from lagging behind the rest of the economy.

A structural adjustment policy was envisaged in the 1980s in response to a rapid decline in oil revenues. The adjustment was accompanied by a series of banking and finance sector deregulations, trade reforms, and liberalization of the investment regime. Macroeconomic balance was restored by a combination of fiscal and external policies. To maintain fiscal balance the government cut back expenditures for large projects and introduced a major tax reform. The exchange rate, as an instrument of policy, played again a key role in the adjustment policies. It was managed to maintain profitability of producing tradable goods, especially in agriculture. The reform of the 1980s had made Indonesia a more diversified, private sector led economy with a rapidly developing financial sector in need of a stronger legal system strong supervisory institution – and unfortunately both were lacking.
During the 1990s before the Asian financial crisis, even with a growing complexity of the economy, a surge of international capital flows, and a regime that became increasingly prone to corruption, collusion and nepotism accelerated growth was taken place. This rapid growth was the result of increased capital intensive growth caused by a considerable investments in capital intensive industry, fed by credit from a liberalized banking sector and increased private sector borrowing from abroad, including for financing infrastructure projects. This situation was monitored by some as phenomena that led toward a growing vulnerability of the economy as indicated by a lack of appropriate controls and oversight in the financial sector, lack of rule of law and corruption which could increasingly undermine the legitimacy of government and the credibility of its policies. However, few predicted the Indonesian crisis, let alone its severity.

The skillful macroeconomic management for which Indonesia was known in successfully coping with several crises in the past came to a real test by the contagion of Thai Baht currency crisis. Despite the early corrective measures to stem the growing outflow of capital, the crisis deepened. What started as currency crisis rapidly turned into a financial crisis, an economic crisis and the political crisis. GDP fell with a contraction of more than 14 percent in 1998, poverty doubled to almost 28 percent at the height of the crisis, inflation peaked at 80 percent, and most of the modern sector, including the banking system and corporate collapsed and went bankrupt.

Since 1998, the country is going through a difficult transition from a centralized, autocratic regime to a more decentralized democratic system of governance. And after a change in the political regime, is rapidly building the institutions it was lacking in the run-up to and during the crisis that hampered crisis management and slowed the recovery process. The formulation of a medium-term development policy framework under Propenas (2000-2004) set the tone for the development agenda of the new government for the next five years. It focuses on five priority areas aim at enhancing and accelerating:

a) A democratic political system and national unity,
b) Supremacy of law and good governance,
c) Economic recovery and sustainable system of people’s economy,
d) Social welfare and quality of religious life and resilience of culture, and
e) Regional development.

This agenda paved the way for the political process of approving four amendments of the constitution and the creation of the necessary institutions needed for modern governance, including an independent central bank, reform of the judiciary, a massive decentralization program, a newly created anti-corruption committee, and emerging free press and a vibrant civil society.

The RPJM for the period 2005-2009 sets out three main agenda. The first agenda is on the creation of a safe and peaceful Indonesia. The second is on the establishment of a just and democratic society. The third is on improving the welfare of all citizens. With respect to the third agenda, the government has identified five key areas for action. The first is maintaining macro-economic stability through stable prices, fiscal
sustainability, and reform of the financial sector. The second is *accelerating investment and exports* by creating a healthy business climate and flexible markets. In this context, the establishment of a more investor friendly climate is a vital component of government action. The third area for priority action is to *increase human capital investment*. Social programs to better prepare people for a more market-oriented economy and to help increase the rate of labor participation would be necessary. The fourth priority area for action is to *protect the environment and improve natural resource management*. And the fifth is in *infrastructure development*, to which the development of an appropriate private sector participation framework is vital. Due to Indonesia’s budgetary constraints, the government's main aim is to concentrate on upgrading the *existing* infrastructure and opening sectors to the private sector in the provision of *new* infrastructure (Soedjito, 2006).

The National Medium Term Development Plan (RPJMN, 2010-2014) is the second phase of implementation of Indonesia's National Long Term Development Plan (RPJPN 2005-2025) promulgated through Law 25/2004. The RPJM (2010-2014) aims at greater consolidation of the reform of Indonesia in all fields by emphasizing endeavors for increasing the quality of human resources, including the promotion of capacity building in science and technology and the strengthening of economic competitiveness. The RPJMN 2010-2014 forms the basis for ministries and government agencies when formulating their respective Strategic Plans (Renstra-KL). Regional governments also must take this medium term plan into account when formulating or adjusting their respective regional development plans. For the implementation of the National Long Term Development Plan, the RPJMN is to be further elaborated into the Annual Government Work Plan (RKP) that will then become the basis for formulating the Draft Government Budget (RAPBN). Under RPJM 2010-2014 in the context of attaining the development targets, the investment funding policies are directed to ensuring the availability and optimizing of development funds towards development funding self-reliance. In this regard, the main strategies of development funding are: (1) optimizing of the sources and schemes of existing as well as future development funds, and (2) increasing the quality of development funding sources and schemes.

Total investment of IDR. 11,913.2 - IDR. 12,462.6 trillion cumulative for five years is needed to attain the average economic growth target of 6.3 - 6.8 percent per year. Out of this total investment required, around 18 percent in 2014 is expected to be provided by the government. Government funding is obtained from tax revenues and non-tax revenues, originating from grants, foreign financing, and from domestic financing. The remaining investment requirement can be obtained from the business community and from banks, non-bank financial institutions, capital market (stocks and bonds), foreign funds, retained earnings, and others. The increase in the proportion of investment funds from the business community mainly comes from the PMA (Foreign Direct Investment) and PMDN (Domestic Direct Investment) in line with the more conducive business climate, from the increased capital market in line with the improved conducive regulatory framework and strengthened management of the capital market, and from the increased governance and performance of companies.
3. The Evolving Infrastructure Specific Development Policy and Strategy

During the 1970s and 1980s, the very large investments in infrastructure many funded by oil revenues and a strong donor support – lowered the costs of connections. Indeed public sector investments and regulatory improvements to lower transaction costs, as an approach to market development, were arguably the crucial link between a growth oriented macroeconomic policy and widespread participation by the community in the market economy. These investments were mainly in roads, communications networks, market infrastructure and ports, and irrigation and water systems. Lower transaction costs mean more market opportunities and faster economic growth, but they also mean better access for the poor to markets and better connections to economic growth by linking household decisions about labor supply to agricultural production and investments in the local economy.

In the mid to late 1980s, through success, the development program became even more encompassing and complex. This enabled very positive moves to more holistic integrated approaches and the need to deal with complexity. At the same time planning inputs and delivery was being pushed more to the now strengthening private sector consultants and contractors. Public-private partnership was being introduced in ad-hoc, sometimes planned, sometimes unsolicited projects. Lack of policy and regulatory framework to deal with tariff adjustments, guarantees or needed subsidies made this a tedious, easily captured and often unsuccessful process. More attempted project negotiations have been forgotten than ever came to closure. At this stage, complexity, scale, participation numbers, the needed and actual rate of progress and the vying viewpoints of ever more sophisticated and diversely motivated interest groups was becoming a real challenge. Some of the political challenge Indonesia now face has its roots in what followed. At the same time, 11% to 12% annual industrial growth and rapid urbanization was increasing the lag of infrastructure behind latent demand. There were latent delays and then new surges forward into the 1990s.

From the early nineties there was a lot of argument in the best ways and roles in managing this, especially for the accelerating infrastructure investment. Under Repelita V (1989/90-1993/94), high priority was given to the development of infrastructure, especially outside Java. This priority was maintained under Repelita VI (1994/95-1998/99) as provision of infrastructure was a necessary condition for accelerating economic growth which was set at an average rate of 7.1 percent. Within this policy framework, a number of key policy and institutional reform was initiated by the government aimed at strengthening the capability of the principal institutions in the sector and sub-sectors of infrastructure to undertake timely and balanced development of the network. The reform, among other things, allowed for greater involvement of the private sector in expanding the capacity and efficiency of the network and improved the commercial capacity of the operators. Alongside this, starting with the elucidation of an overall strategy in then late eighties, the drive to achieve circumstances conducive with private sector investment on a project by project and then a sector basis was accelerating (Soedjito, 2004).
Indonesia’s geography and uneven distribution of population resources complicate the task of infrastructure provision. Inter-island shipping, river transport, and civil aviation necessarily play crucial and complementary roles in a complex domestic transport system that serves densely populated Java, the rugged and sparsely populated terrain of Papua, and the hundreds of populated small islands in the Malukus and Nusatenggaras. Electricity supply systems outside the large interconnected Java-Bali grid are highly fragmented, while the most important of Indonesia’s abundant primary energy resources are located far from its main demand centers. The economic crisis has also contributed significantly to the severity of the current infrastructure woes. Moreover, the past economic boom prior to the crisis overshadowed the urgency for infrastructure sector the much needed reforms and as a result adequate public policies in infrastructure were never put in place, and corruption went unchecked. Although considerable progress has been made thus far, particularly in the energy sector and telecommunications sub-sector, that reforms have been insufficient, scattered, and uncoordinated. The issues are usually dealt with a single sectoral view disregarding the fact that there are common issues that transcend individual infrastructure sectors including poor public management, insufficient user charges, inadequate financing, and lack of credibility to mobilize private sector investments, difficult decentralization challenges and weak governance (Soedjito, 2004a).

Immediately post crisis, in 1998 and 1999 the government took immediate steps to rapidly slowing down and cutting back of development project funding from domestic and donor sources. Whilst sector agencies and local governments continued to be encouraged to develop strategy responses to the post crisis situation that was within the constraints of little new development funding, the economic ministries directed reapplication of the reduced funds to maintaining rather than upgrading infrastructure services and assets. A necessary but ultimately costly decision was made with respect to the postponement and cancellation of large scale public-private partnership projects in infrastructure formalized by Presidential Decree (Keppres) 39/1997. By 2000 the Ministry of Finance, to minimize risks to prudent fiscal management, issued a letter, later supported by regulation, preventing local governments circumventing the expenditure limits by raising loans.

These early government initiatives were matched by donors switching of their new funding away from the project/sector loans and towards programmatic funding, mainly to support the social safety net strategy. This, along with immature frameworks and public resistance to cost recovery, has led to a necessary but extreme slowdown in infrastructure network development. The impacts are most visible in power, roads, transportation and gas where they are restraints to the rate of economic revival. But there are also immense latent backlogs there and in telecommunications, water supply, sanitation, irrigation, drainage and flood control. The long lead times to address these latent backlogs imply the need for rapid action to minimize the economic losses later in this decade and the next, with indirect and multiplier effects persisting long beyond that (Soedjito, 2004).

Under Propenas (2000-2004), public investment in infrastructure focuses on maintaining the pre-crisis level of infrastructure services through rehabilitation and
betterment of the existing networks and the priority works are determined on the basis of some criteria, including economic and urgent social considerations, improving infrastructure services that support production and export activities, and expansion of employment and business opportunities. Greater competition or de-monopolization of infrastructure provision and services and enhanced private sector participation in infrastructure with transparent and competitive process are key policy reforms in infrastructure. The current decision making process for determining how infrastructure projects are approved is a transition between the problematic post-crisis, post-rapid decentralization situations together with accompanying political and institutional processes underway.

This radically changed the relationship between legislature-executive, and the integrity of the planning, budget, implementation and monitoring of service delivery and development. Combined with the aftermath of financial system failures and slow economic recovery, infrastructure investment shortages and delivery problems are going to increasingly constrain growth, quality of life, poverty reduction and environmental and resource management. In general, this describes a situation where infrastructure planning and budgeting systems have been heavily disrupted, but in which the impact of that disruption has been overshadowed by the overall shortage of domestic and borrowed funds, and the years of disruption to private investments. As the potential and priority for infrastructure investments is now being recognized, so is the urgency to debate and implement planning, funding and budgeting reforms. This is necessary for effective growth in public expenditure and a revitalizing of private investments.

In realizing the vision and mission of national development from 2010-2014 (RPJMN 2010-2014), infrastructure development in Indonesia is focused to provide capacity and carrying capacity towards economic growth and social justice and the interests of the general public to encourage public participation. Accelerated economic growth requires additional quantity and quality infrastructure improvements. Revitalization of agriculture cannot succeed without adequate infrastructure given the cost of marketing the more dominant in the structure of the final cost of agricultural commodities. Poor families would not be able to participate in the wave of economic growth if they are isolated due to lack of infrastructure. Environmental problems such as water pollution, air and soil, or flooding in the urban environment has strong links with the absence of adequate infrastructure. Although spending in infrastructure has been improved, the infrastructure gap is still felt both at the national and inter-regional levels. Therefore, the development of basic infrastructure must become a priority.

The improvement of infrastructure development is not only become the focus of the 2010-2014 RPJMN, but also became one of the main pillars in the MP3EI. The policy rests on three main pillars: establishing six economic corridors based on the comparative advantage of the different regions of Indonesia; promoting connectivity within Indonesia, the ASEAN region and globally as well as improving human resources and science and technology (MP3EI Document, 2011). Infrastructure development in the context of MP3EI intended to support the acceleration of economic growth in six “economic corridors” in Indonesia. To accelerate economic
growth, the MP3EI document designates eight economic programs that consist of 22 economic activities as illustrated in the Figure 3.1 below.

![Figure 3.1 Indication of Investment in The Major Economic Activities](image)

*Source: MP3EI Document, 2011*

The smooth operation of these economic activities will rely on good infrastructure to support mobility. In fact, as one of the main pillars of the MP3EI, strengthening national connectivity includes the development of infrastructure as a key strategy to achieve not only regional connectivity but also a global connectivity. As an archipelagic country, developing infrastructure to better connect the regions is undoubtedly important. Yet Indonesia received a wake-up call when the Global Competitiveness Report 2009-2010 ranked the country 96 out of 133 countries for infrastructure competitiveness. Although the current report of 2013-2014 shows major improvement in its global competitiveness (50 out of 144 countries) and also in infrastructure (ranked 61), however the report also states that the government must have good strategies to improve the quantity and quality of infrastructure development where insufficient infrastructure and poor connectivity are major obstacles to development for Indonesia (The World Economic Forum, 2013).

4. The Financing Needs for Infrastructure

Considerable financing is required to meet the demand for infrastructure services in developing countries. But no one really knows how much is needed. Briceno and others estimated the investment needs in infrastructure across country income groups as summarized in Table 4.1 (Briceno and others, 2004). The most interesting fact emerging from these rough orders of magnitude is that there are large differences across country income groups, with needs ranging from as much as 9 percent of GDP.
for low-income countries to 5.5 percent for middle-income countries, with an average of about 7.1 percent for all developing countries.

Table 4.1 Expected annual investment and operations and maintenance needs, 2005-2010 (percentage of GDP)

<table>
<thead>
<tr>
<th>Country Group</th>
<th>Investment Needs</th>
<th>O &amp; M Needs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Income</td>
<td>3.5 - 4.5</td>
<td>4.0 - 4.5</td>
<td>7.5 - 9.0</td>
</tr>
<tr>
<td>Middle Income</td>
<td>2.8 - 3.8</td>
<td>2.7 - 3.2</td>
<td>5.5 - 7.0</td>
</tr>
<tr>
<td>Developing Country Average</td>
<td>3.2 - 4.2</td>
<td>3.3 - 3.5</td>
<td>6.5 - 7.7</td>
</tr>
</tbody>
</table>

Note: These are preliminary estimates.

Demands on the development and maintenance of the infrastructure were in line with economy and population growth. Hence, the pressure to provide adequate infrastructure will naturally lead to higher financing needs that exceed the fiscal capacity of the central government. Consequently, the potential economic limitations will occur due to inadequate infrastructure. Therefore, the infrastructure provision which previously free of charge now requires a payment in the form of customs, fees and tariffs in order to generate additional revenue to overcome the pressure on infrastructure provision (Howes and Robinson, 2005).

The declined capacity of the government in the financing of infrastructure is getting more complex, since there are other expenditure posts which are need to be financed as well. However, the increase in government revenue from taxes or other revenue sources is not equal with the needs for infrastructure. Infrastructure financing is very important not only to pursue economic growth, but also to improve the distribution of the benefits of sharing the economic growth (UN-ESCAP, 2006). Besides its role, the provision of infrastructure can also be reviewed through two perspectives, namely the proportion of requirement types and supply chain.

Looking from the first perspective, infrastructure needs is reviewed through a proportional amount based on total expenditure (total expenditure) and gross domestic product (GDP). Total expenditure is derived from the government and private sectors based on the general classification of infrastructure: roads, railroads, telecommunications, electricity and water. The second perspective is the supply chain infrastructure. This perspective examines the infrastructure financing needs of a series of actions or activities in the provision of infrastructure. Process in the provision of infrastructure consists of eight stages, namely the feasibility study (feasibility study); outline design; planning; fulfillment of legal requirements; design preparation; detail design, construction; manufacturing management structure and operation, and the whole provision process needs financing (Howes and Robinson, 2005).

Table 4.2 indicates that the annual expenditure for infrastructure tends to increase until the next two decades, except for communications. Water supply has being the most spending sector, followed by transportation (road and railway) and electricity respectively. It is roughly estimated that an amount of $57 trillion is needed for
infrastructure investment from 2013-2030, in order to keep up with projected global GDP growth (MGI, 2013). Nevertheless, this amount would not be sufficient to address major backlogs and deficiencies in infrastructure maintenance and renewal or meet the broader development goals of emerging economies. Moreover, the task of funding the world’s infrastructure needs is more difficult because of constraints on public sector budgets and commercial debt in the wake of the financial crisis.

In some developing countries like Indonesia, financial crisis had a serious impact in infrastructure provision. Before the crisis serious work in mobilizing private investment had been going on for 5-8 years in different sectors. Private investments in hand, planned, mobilized or being implemented amounted to about $190 billion over a ten year period. Dominant sectors were power generation ($60+ billion), telecommunications ($9+ billion), transportation ($7+ billion), and toll roads ($15+ billion) in the first five year of start-ups with substantial progress towards application of best practice approaches. Only a fraction of more than $3.5 billion in immediate prospects had been mobilized in water and sanitation.

**Table 4.2 The Average Annual World Expenditure on Infrastructure: Forecast and Percentage of World GDP**

<table>
<thead>
<tr>
<th>Type of Infrastructure</th>
<th>2000–2010 (US$ billion)</th>
<th>Approximate % of World GDP</th>
<th>2010–2020 (US$ billion)</th>
<th>Approximate % of World GDP</th>
<th>2020–2030 (US$ billion)</th>
<th>Approximate % of World GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road</td>
<td>220</td>
<td>0.38</td>
<td>245</td>
<td>0.32</td>
<td>292</td>
<td>0.29</td>
</tr>
<tr>
<td>Rail</td>
<td>49</td>
<td>0.09</td>
<td>54</td>
<td>0.07</td>
<td>58</td>
<td>0.06</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>654</td>
<td>1.14</td>
<td>646</td>
<td>0.85</td>
<td>171</td>
<td>0.17</td>
</tr>
<tr>
<td>Electricity</td>
<td>127</td>
<td>0.22</td>
<td>180</td>
<td>0.24</td>
<td>241</td>
<td>0.24</td>
</tr>
<tr>
<td>Water</td>
<td>576</td>
<td>1.01</td>
<td>772</td>
<td>1.01</td>
<td>1,037</td>
<td>1.03</td>
</tr>
<tr>
<td>Total</td>
<td>1,626</td>
<td>2.84</td>
<td>1,897</td>
<td>2.58</td>
<td>1,799</td>
<td>1.79</td>
</tr>
</tbody>
</table>

Note: Telecommunications estimates apply to 2005, 2015 and 2025; electricity refers to transmission and distribution only, water estimates apply to 2005, 2015, and 2025 only, and only to OECD countries, Russia, China, India and Brazil.

International and international-through-domestic bank financing dominated both PPP and FDI. Only the most highly regarded enterprises (PLN, TELKOM and Jasa Marga) and companies were rapidly increasing their access to bond markets. Public enterprise corporatisation and IPOs were significant in scale but limited to a sub-group of these enterprises. Other domestic saving and investment channels were very underdeveloped. No municipal bond market had been developed to support urban water and waste water services. Government, bilateral and multilateral guarantee/risk management schemes underdeveloped in coverage, as was the internalizing of risk costs and scale. With underdeveloped macro economic, financial, and legal frameworks, debt providers adopted conservative positions that forced major
currency and contingent liabilities to reside with public enterprises/agencies rather than investors/projects.

The situation in different sectors and sub-sectors (Soedjito, 2004a):

a) In power sub-sector, the private investments were dominated by unsolicited projects negotiated on the basis of adjusting precedent from the first, Paiton power station. And there were limited competitive pressure until 1996. Power prices high but gradually reducing, contingent liabilities on power purchase agreement (PPA) becoming overwhelming and PLN resistance growing. Response to growing calls for solid regulatory framework, competitive bidding and progressive market restructuring started in 1996.

b) In toll roads, the procurement of investors switched from unsolicited projects to planned, transparent competition and provision for unsolicited subject to competitive bid had commenced in 1995. Empirical evidence showed competition being effective in rejecting collusion and reducing prices. Large domestic rupiah funding component, no subsidies, and rupiah tariffs based on user savings and President endorsement.

c) In other transport sub-sectors: privatization of airport and port operations on a competitive base proceeding on a case-by-case basis, domestic and international airline access slowly growing, investigations for BOT variants in airports and ports being mobilized; restructuring, privatization and PPP in railway was under discussion with slow progress; private investment in urban transport was constrained by poor service level and usage problems.

d) By 1994 the telecommunication sub-sector was transitioning from twin international and domestic government enterprise monopolies to PPP in PLOTS/fixed radio phones and with open licensed mobile phone market and private networks; private investments as PPP through cooperative working agreements (KSOs) for regional PLOTS monopolies were established across the country, these combined public and private investment and service responsibilities; a comprehensive ICT vision (Nusantara 21) had been adopted to services development and transition in the telecommunication market, but affordability and market structure were constraints; implementing the supporting regulatory changes was slow, however private sector competition for the allocated markets was hot and service cost recovery and affordability were not major barriers to urban areas, but restrained secondary center and rural services; restructuring for market reform, instilling universal service obligation (USO) practice and unraveling barriers to rapid and deployment of new technologies were already seen as the major challenge.

Overview of the pre-crisis situation indicated that fiscal management of public sector expenditure was prudent and Indonesia enjoyed a solid credit rating. There was capacity to increase this but the combination of domestic and international consensus was that these sectors were and could receive more, or most, funding from private sources, releasing public funds for programs with less, or no commercial potential. The prevailing view, expressed by economic partners, the development banks and of course the private sector was that private investments could be better regulated, more
responsive than centralized public service provision, and corruption would also be reduced. On the other hand, there was strong sentiment in senior levels of bureaucracy for regulatory reform and application of best practices, to address corruption, rent seeking and dangerous risk allocations in the private investments and move to more healthy competitive situations. There was deep concern over the levels of foreign debt and the lack of a strong domestic capital market to turn to. There was also a general low faith, coming from quite different perspectives among the public, investors and the bureaucracy in speed and fairness of mechanism for setting public tariffs.

Overall the situation was moving forward rapidly, infrastructure finance was growing and growing more effectively, but risk components were increasing also to the level where they were significant in terms of overall investment and financial sector confidence. Looking ahead it seemed the prospects to transition to healthy competitive private investing complementing focused public investment and improved service and cost recovery looked good.

After the crisis the immediate impact and response showed that currency plunged, ability of local banks to finance on-going projects dried, and actual tariffs fell well below dollar costs in most projects. Projects dominated by foreign debt immediately became dependent on ability, willingness and speed of local tariff adjustments. Meanwhile, foreign banks waited and also cut-off fund flows through local banks. Many projects depended on government owned and other banks under conditions where ‘force majeure’ would trigger calls on those banks from their international partners.

Central government funding for infrastructure was gradually falling from a level the equivalent to several USD billion per year to perhaps USD 0.7 billion per year. However because of efficiencies being gained the level of service delivered was not dropping in line with the funding cut backs. This was noticeably so in progressive improvements of targeting urban expenditures, along with land and property tax (PBB) improvements, and in roads. Together with investments from cooperation with the private sector, the extent, service level and efficiency of infrastructure services was improving overall. However because of rapid economic, lagged demand that was growing at 8% to 14% per year in large growth centers. A severe lag in services was also still being carried forward in many secondary cities and rural areas. The diversity of challenges was a reflection in general, but unevenly distributed economic success. The issue of the need for regional and individual equity in opportunity from small communities up was concerning many, but progress was limited. Before the crisis the local government contribution to infrastructure funding was limited to part of the cost of Kabupaten roads and small scale work such as drainage, with local government being overall net financial beneficiaries of central government subsidized water and sanitation services.

As a way of putting things on ice and preventing new projects building up unnecessary obligations and expectations, a Presidential Decree in 1997 (Keppres 39/1997) froze over half of the investment in-process. This was to allow time for restructuring, but the hurdles to be overcome grew and the volume of projects that
have moved forward to completion is small. Solving the problems in the on-going projects or unwinding them to become major hurdles to progress. With banks in crisis, miss-channeled funds to corporations disappearing from the economy and the radical fall in domestic and international confidence and demand, alongside currency induced cost surges, the major public policy concerns were to reduce poverty and social impacts. The logic was clear in terms of immediate benefits, the appreciation of the costs of channeling public and official funds to basically short term subsidies and consumption were not widely appreciated. One has to appreciate this was major distortion of public spending on the basis that infrastructure could wait for a few years for recovery.

The many unsolicited deals and perceptions of collusion caused public and political opposition to efforts to save existing investors’ and banks’ projects through massive tariff increases. But still much of his government borrowing power and capacity of the domestic debt and bond market were sunk into the banks. Adjustments of tariffs, and cuts in fuel subsidies and potential inflation multiplier effects became part of the hot social issues leading to demonstrations. A public perception grew of massive leakage of funds to save local bank owners, from the effects of their unsound relationships with business, financing assistance to big business became politically difficult. External and internal constraints on public borrowing initiatives to finance most projects through the post-crisis recovery, even with Special Yen Loan.

Elections put the government charged with achieving true democracy, transparency and an end to collusive and corrupt practices. Clearly that hard work is still very much work in progress. For unity, greater democracy and in the search for accountability and in efficiency the people of Indonesia determined to drastically decentralize government fiscal control and functions, mainly to districts and municipalities, now more than 400 local governments control much of economic development, services and infrastructure.

From 1997 through to 2001 conservative and restrictive external advice on fiscal management was interpreted under popular and political pressure into continued cut backs in infrastructure. Many players suspected the infrastructure of the past was wrongly motivated and that cutting back funding would reduce wastage in the short run, and economic revival would fund later increases without long term losses. In mid 2001 it was estimated that despite economic slowdown and slow recovery, the shortage of government allocations to infrastructure at all levels, the slow progress in funding government enterprises out of cost recovery schemes, and low implementation of private investments had left Indonesia with infrastructure shortages equivalent to about 10-12 percent of GDP. As demand starting passing the sometimes degrading infrastructure capacity in different regions and sectors by 2001, the economic loss was no longer just in immediate costs to users and assets that would need to be repaired. It was and is eroding competitiveness in domestic and international markets, holding back expectations and productive sector investments. Failure of the bank system and the distortion of the huge government bond financing had already combined to put Indonesia on the unforeseen path that would continue to inhibit infrastructure playing its role, and of a less and less competitive and less equitable economy.
Economic crisis increase has impacted on the increasing risk to investors, especially for long-term investment in infrastructure. The credit ratings dropped has resulted in the high cost of capital and increasing cost of debt. Practically, there were no new investments. At the same time, demand of infrastructure will increase, especially in the central growth (urbanization) was far exceeded the rate of economic growth, resulting in backlogs estimated at 14-19% of GDP. Covering these backlogs may take quite a long time, even then with the assumption that the rate of infrastructure investment is greater than the rate of growth in demand for infrastructure. If equal or smaller, then the amount of such backlogs remain constant or getting bigger, then the economic recovery becomes more difficult.

An amount of infrastructure is substantially required both to support economic growth and to pursue earlier backlogs. The national first mid-term development plan (RPJM 2005-2009)\(^3\) and second year plan (RPJM 2010-2014)\(^4\) has directed economic growth per year on average by 6.6% and 6.8% respectively. Considering the ability only about 2-3 % of GDP to allocate budget on infrastructure sectors (even if it’s insufficient for operation and maintenance, less for new construction), there is no other way except to mobilize substantial funding from the private sector, especially for new development or upgrading (improving efficiency) of existing infrastructure. But to achieve this, there is an inevitable need for development policy reform and infrastructure provision as a whole, especially those policy which directed to unfold and increase the opportunity of private participation.

In addition to cover the financing gap,\(^5\) there are other facets of private participation in the provision of infrastructure, namely: first, restructuring and unbundling integrated infrastructure industry will increase competition and choice. Secondly, it will create the economic regulation of natural monopolies more effective. Both elements have been found Indonesia at this time, but were still at an early stage and haven’t been able to meet all the infrastructure investment needs.

The need for infrastructure investment in the first mid-term plan of 2005-2009 was IDR.700 trillion to achieve an average growth of 5-6 % per year. To achieve that, the government has invited private sectors to invest in infrastructure sector through Infrastructure Summit 2005. On that occasion, there were 91 projects offered to investors. There was a milestone for the sustainability of public-private partnerships, regarding to regulation, institution and policies. In terms of institutions, the Government had established the Inter-ministerial Committee on Policy for

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5 The Financing Infrastracture Development Team (TPPI) indicated infrastructure investment need of Rp1303 trillion for 5 years (2005-2009). Public investment (APBN) provides only Rp 224 – 326 trillion, meanwhile the domestic capial market was provided around Rp179 – 332 trillion, as bilateral and multilateral loans provided Rp90 trillion. Therefore the financing gap was between Rp657 trillion to Rp887 trillion (TPPI, 2004, Road Map Infrastructure Financing - the Needs, Potential of Financing and Proposed Scheme, Jakarta: December 2004). On the other hand, The World Bank estimated the financing gap around 17.8 billion USD each year for the next 5 years or for 1 USD the state budget (APBN) must be able to draw 4.24 USD of private fund and bilateral & multilateral loans.(The World Bank, Indonesia: Development of a PPP and Risk Management Framework – Mobilizing Private Capital and Management into Infrastructure Development. IEF: July 2005).
Acceleration of Infrastructure Development (KKPPI). Meanwhile, a new milestone regulation to implementing PPP was the Presidential Regulation of 67/2005 on Public Private Partnership in the Provision of Infrastructure. The current progress shows that the cross sector regulation has been revised and refined in Presidential Regulations (Perpres 13/2010 and Perpres 56/2011) to adjust the needs of infrastructure development on the second five year development plan.

According to Bappenas, during the second -five year development plan (RPJM 2010 – 2014), there is a Rp 1,429.3 trillion (USD 142.93 billion) need for infrastructure investment or estimated as 5% of GDP. The national budget only covers 35.75% or Rp510.97 trillion. Hence, the remaining gap of 64.25% or Rp 918.32 trillion (USD 91.8 billion) is directed to the private sector participation. The figures indicated that the infrastructure development goals would be achieved if the non–government financial sources are fulfilled. The national planning board (Bappenas) reported that there are several sectors which distinctively need to be financed by private sectors, they are: power and electricity, communication, transportation, highway, water supply and housing. Among those sectors, the power and electricity occupies the first rank in terms of investment needs (see Table 4.3).

From Table 4.3, it could be understood generally that the financial gap has exceeded the public fund, since the Government’s ability only covers less than 25% of the investment needs. The power and electricity has the biggest investment needs. This sector valued USD 30 – 35 billion, with USD 10 billion is covered by the government and private covers the remaining USD 20 billion. Sector which needs the most private funding is post and telecommunication, with only 7.6% public sharing and 92.4% proportion goes to private sector. Besides, there are also several sectors needed more proportion of private investments such as energy, transportation and housing. Each sector needs more than 60% private financing. The least depended sector is water supply, because the government has been capable to spend more than 80% of the investment needs.

<table>
<thead>
<tr>
<th>No.</th>
<th>Sector</th>
<th>Investment Needs (USD billion)</th>
<th>Government Capacity (USD billion)</th>
<th>Financing Gap (USD billion)</th>
<th>Private Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Power and Electricity</td>
<td>30</td>
<td>10</td>
<td>20</td>
<td>67</td>
</tr>
<tr>
<td>2.</td>
<td>Energy</td>
<td>7</td>
<td>2</td>
<td>5</td>
<td>71.4</td>
</tr>
<tr>
<td>3.</td>
<td>Post &amp; Telecommunication</td>
<td>27</td>
<td>2</td>
<td>25</td>
<td>92.6</td>
</tr>
<tr>
<td>4.</td>
<td>Road and highway</td>
<td>22</td>
<td>7</td>
<td>15</td>
<td>68.1</td>
</tr>
<tr>
<td>5.</td>
<td>Water supply</td>
<td>6</td>
<td>1</td>
<td>5</td>
<td>16.7</td>
</tr>
<tr>
<td>6.</td>
<td>Housing and Settlement</td>
<td>16</td>
<td>2</td>
<td>14</td>
<td>87.5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>108</td>
<td>24</td>
<td>84</td>
<td>77.7</td>
</tr>
</tbody>
</table>

*Source: KPS Magazine, 8th issue, October 2009.*
In recent days, the needs for infrastructure investment have increased to accelerate economic growth to improve competitiveness, consistent with the Master Plan for The Acceleration and Expansion of Indonesia’s Economic Development (MP3EI) in May 2011. For MP3EI, infrastructure is expected to play a pivotal role to advance Indonesia to become a developed country in conjunction with the development of the six economic corridors. The MP3EI has selected top 40 infrastructure priority projects consisting of 15 projects with total investment of IDR 36.2 trillion for groundbreaking in 2014 and 25 projects with total investment of IDR 300.8 trillion for groundbreaking in 2017. The majority of 15 priority projects intended for groundbreaking in 2014 will be financed by the government (7 projects financed by pure APBN and 4 projects funded from bilateral and multilateral loans) and the remaining 4 projects by state owned enterprises (BUMN) financing. Meanwhile the majority of 25 projects for the groundbreaking in 2017 will be implemented by PPP scheme (17 projects) and the remaining 8 projects will be financed by the pure APBN (5 projects), bilateral and multilateral borrowings (2 projects) and 1 project by direct appointment to BUMN.

5. Private Sector Participation in Infrastructure Provision and Services

Governments in emerging countries have limited financial resources to devote to capital expenditures and expanded public services. To bridge the gap between available public resources and the cost of needed infrastructure and services and to ensure that infrastructure and services are delivered as efficiently and cost-effectively as possible, public authorities are increasingly turning to public-private partnerships (PPPs).6

In Indonesia one of the early areas of mutuality of purpose, if not yet coordination, among donors was on the public-private-partnership (PPP) for infrastructure from early in the nineties and still is today. The government and donors lent their support to the concept of PPP in the eighties and were responsive to the private sector, state owned enterprises and provincial government proposals that were made then. These were not entirely unsolicited. Competition had been applied to bulk water investment even then. But because of the lack of a solid starting framework or contract to bid under, the post bid negotiations were as tortuous as those for unsolicited investments. The stumbling block was chiefly in assurances of tariff adjustments and the part of that dependent on the fluctuation of the Rupiah. The involvement of the special interests on the investor’s side was a key part of investors’ willingness to trust to the future government processes. However these special interests, the motivating benefits they derived from decisions to invest and the cost attached to that became visibly heavy influences on project conditions, and decisions to proceed in some sectors. The resulting contingent liabilities had become a serious concern in power by the late nineties. In toll roads, these pressures appear to be less influential,

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6 Public-private partnerships can help improve public infrastructure and services through shorter delivery times, better value for money and increased innovation across a range of sectors.
especially from the late nineties. However the overall situation for these investments was fragile.

Work on comprehensive frameworks in some sub-sectors, and a more extensive cross-sectoral umbrella framework and institutional approach was underway in 1998 when the economic crisis hit. The government then took a radical action to stop the bulk of investments that were not in implementation through a Presidential Decree No. 39/1997. Meanwhile the economic ministries were working with infrastructure line agencies to bring some order, competition and transparency to this PPP process also under a Presidential Decree (Keppres 7/1998). After the crisis, after a pause, the work on new sector laws, regulations and institutional transitions towards a well regulated framework for PPP and privatization has renewed as part of the sector reforms, with notable progress in oil and gas, power generation, telecommunications and toll roads. Progress has been slower in transportation and water. This process is far from complete. A basis for policy, planning and regulatory coordination was envisioned as far back as 1998 by bringing these sub-sector processes, and the financing priority reviews, under the general overview of a Inter-ministerial Committee on Policy for Acceleration of Infrastructure Development (KKPPI) headed by the Coordinating Minister for the Economy.

Since the late 1980s, many developing countries had a tendency to follow the global trend in private sector participation in the development and provision of infrastructure. Including Indonesia, which in the early 1990s had begun its efforts to attract private investment in infrastructure provision. According to the World Bank, until the end of 1997, Indonesia had managed to attract more than 20 billion USD of private investment in the infrastructure sector is dominated by electricity (10.2 billion USD), telecommunications (8.4 billion USD) and transport (2.1 billion USD) (the World Bank, 2004).

In 1996, the New Order government host the ministerial-level international conference on public-private partnerships in infrastructure development themed “Frontiers of the Public-Private Interface in East Asia’s Infrastructure”8. This conference implicitly stated that previously, public-private partnerships in infrastructure development and transactions had not been underpinned by a framework of partnership (PPP framework), a framework which sets a clear rules and certainty on the principle of partnership, the role of government, the handling of commercial aspects, competitive procurement process, and protection of intellectual property rights and the existence of regulatory institutions that ensure level playing field in the implementation of the public-private partnership.

Since the early 1990s the Government has obtained a variety of technical assistance from bilateral agencies and multilateral institutions to promote private participation

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8 The Conference was jointly organized by Bappenas and the World Bank attended by ministers and senior officials from 21 countries, as well as multi-lateral and bilateral representatives. (LPEN-INDES, 1997, Public Private Partnerships in Infrastructure Development in East Asia, Proceedings of Ministerial International Conference in Infrastructure Development, Jakarta: 2-4 September 1996).
in infrastructure development\textsuperscript{9}. The overall technical assistance also provides capacity building assistance and institutional strengthening. But only after the International Conference 1996, Bappenas take the initiative for drafting regulatory framework on PPP through the use of technical assistance from CIDA and the World Bank\textsuperscript{10}. Manuscript that has been discussed inter-departmental forum (cross-departmental) ended in early 1998 signed by the President as a Presidential Regulation (Keppres 7/1998) on Public Private Partnership in Business Development and / or Management of Infrastructure.

Unfortunately, this regulation imposed when Indonesia was hit by the financial crisis (financial crisis) which triggered the economic crisis that led to the fall of the New Order regime in 1998. So that none of the Cooperation Project (PPP) was prepared and transacted following the rules set out in Keppres 7/1998. The economic crisis led to the flight of capital out of the country, economic contraction, the decline in the exchange rate, high inflation and shrinking reserves. All this resulted in a lot of infrastructure projects are delayed, restructured and even stopped.\textsuperscript{11} Including 27 power projects (IPP-independent power producers) which must be renegotiated its PPA (power purchase agreement).

In the reform period, the Government conducted a review of the status of the projects set out in Keppres 39/1997 with the revived projects that include deferred category and reviewed in succession through Keppres 64/2000 and Keppres 15/2002. The results include a new PLN almost managed to sign a PPA for all electrical projects renegotiation results with 26 IPPs. In terms of institutions, to improve coordination in decision-making in the context of accelerated infrastructure development program, the Government through Keppres 81/2001 established the Committee on Policy for Acceleration of Infrastructure Development (KKPPI). The committee’s task is to formulate a regulatory framework for public private partnership in infrastructure development by refining Keppres 7/1998.

Since the financial crisis, public investment in infrastructure in Indonesia decreased dramatically from about 5% of GDP (8 billion USD) in 1994 to only about 2% of GDP (1.5 billion USD) in 2002. The same thing happens with private investment

\textsuperscript{9} Those technical assistance came from Canada (CIDA); Infrastructure Services Project phase I and phase II (ISP), and Transport Infrastructure Services Support (TISS); USA (USAID); Public-private Partnership in Urban Services (PURSE), Municipal Finance Project (MFP), and Breakthrough Initiatives for Local Development Project (BUILD); the Asian Development Bank (ADB); Private Sector Participation in the Transport Sector, Capacity Building in Urban Infrastructure Management (CBUIM), the Regulatory Framework for Private and Public Water Supply and Wastewater Enterprises, Facilitating Private Sector Participation in Ports Infrastructure under Decentralization, and Strategic Planning Study for Power Sector; dan the World Bank (IBRD); Technical Assistance for Public-private Partnership in the Provision of Infrastructure: phase I and phase II (TAPI-1 & TAPI-2), Bali Urban Infrastructure Development Project (BUIP). (Source: Bambang Bintoro Soedjito, 2007; "A Brief Report on Public-Private Partnerships in Infrastructure in Indonesia," Working Paper, Support for Infrastructure Development Project (SID), ADB-TA 4728).

\textsuperscript{10} Only CIDA (through ISP) and the World Bank (through TAPI) focused their technical assistance on developing kerangka cross-sector regulatory framework, the others aimed at developing sector PPP framework or PPP by the local governments especially for urban infrastructure.

\textsuperscript{11} The Government issued Keppres 39/1997 to declare that from 178 projects financed by export and SOE (BUMN) and private sector projects related to government and BUMN, around 70 projects were postponed, 27 projects to be reassessed dan 81 projects proceeded.
declined by 90% from 6.5 billion USD in 1996 to only 0.6 billion in 2000. As a result, investment in infrastructure following the crisis in terms of the percentage of GDP was at a level below the rate of investment during the period 1990-1996. Crisis stemming from the financial crisis became multidimensional crisis which forced the government to stop and delay infrastructure projects funded from both public and private sectors. The rupiah (currency) fall, policy uncertainty, and the slow pace of regulatory reform (legislation) and institutional infrastructure in almost all sectors, especially in terms of increasing private sector participation in infrastructure development had given rise to a fundamental awareness of just how fragile the infrastructure sector and was unable to withstand the onslaught of the turbulence of the multidimensional crisis.

The limited scope and poor service quality, lack of transparency and justice (fairness) in tariff policy, the lack of clarity and lack of consistency of the regulatory framework, land acquisition and environmental impact, and low allocation of the state budget, had made the infrastructure sector worse off. Quality infrastructure and its services hindered private investment and indirectly resulted in adverse impact on the poor by reducing their access to clean water and sanitation facilities and access to markets. According to the business survey conducted in 2002 by the international investment community, Indonesia ranks only 69th of 104 countries in terms of the quality of its infrastructure. Measured by various indicators of infrastructure, Indonesia has become less competitive relative to 11 neighboring countries in Asia and Australia.

Indonesia is now at the transition to a democratic political system, decentralized governance and competitive market economic order and justice, including providing opportunities of private participation in infrastructure provision. As with most developing countries, the effectiveness of private sector participation in Indonesia is plagued by a variety of factors, including inadequate legal and regulatory framework, institutional barriers, and the preparation of the concession contract which is not structured properly (does not meet international standards), high transaction costs and does not have satisfactory track records in terms of transacting public-private partnerships in infrastructure development.

To display the seriousness in promoting public private partnership in the infrastructure provision, the government of the transformation era since 2005 has held four international events in which a list of PPP projects was offered to the market. Beginning with the 2005 Infrastructure Summit offered 91 PPP projects. Next was in Indonesia Infrastructure Conference and Exhibition (IICE 2006), government became more realistic with only 10 pilot model projects, and three

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13 The World Bank (2002). World Development Indicators. Washington, DC.

14 These ten projects were Central Java Coal Fired Power Plant; Pasuruan Combined Cycle Power Plant; Medan-Kuala Namu Toll Road; Solo-Kertosono Toll Road; Margagiri-Ketapang Ferry Terminal; Teluk Lamong Seaport (Tanjung Perak Port Expansion); Bandung Water Supply; Dumai Water Supply; Tangerang Water Supply; and Palapa Ring Telecommunications.
years ago, in 2010 when organizing Asia Infrastructure 2010, in the framework of Asia Pacific Ministerial Conference on PPP for Infrastructure Development (APMC 2010) government offered less, which was only five PPP projects\(^5\). In 2011, the Chambers of Commerce and Industry (KADIN) along with the government has just held Indonesia International Infrastructure Conference and Exhibition 2011 (IIICE 2011) where 16 projects including 5 showcase projects\(^6\) were offered (Soedjito, 2011).

A lot of actions have been done to improving infrastructure provision, yet only some projects were taken into account. Some of the projects are now in the transaction phase, fewer has reached financial close and only on a small number had been realized. This situation directs to the issue that we need a strong and capable institution to persuade investor, manage contract and build the project sufficiently. Meanwhile, there has to be a legal framework and policy to cover the risk and ensuring the project sustainability. Since 2005 to date, the Government of Indonesia has established a robust, competitive legal and regulatory framework for PPP – from procurement of the PPP concessionaire to the provision of government support and guarantees. The governing regulation on PPP is Presidential Regulation (Perpres) 67/2005, amended subsequently by Perpres 13/2010 and 56/2011 (Bappenas, 2012) as well as by Perpres 66/2013.\(^7\)

Perpres 67/2005 has been a significant milestone in the reform of infrastructure, having already reflects the principles of openness, and competition. Along with the progress of this regulation, various sub-sectors of infrastructure laws has been issued These sectoral laws has generally facilitated the setting of public private partnership, eliminating monopoly of the SOEs (BUMN) and adjust to the infrastructure policy of decentralization of public services. But in fact, the implementation of the PPP program was considered less successful reviewed by those criteria. Therefore, the Government sensed the need to revise the cross-sector regulatory frameworks because of lack of clarity in some provisions of the Presidential Decree 67/2005, such as the definition of responsible agent of the cooperation project, the shape and scope of government support, the definition of acquisition financing (financial close), the obligation to carry out public consultation, and the second auction allowed.

In January 2010, the Government issued Perpres 13/2010 on the Amendment of Perpres 67/2005 on Public Private Partnership in the Provision of Infrastructure which has explicitly declared that the government could provide a direct support, including fiscal support, land acquisition and part of the construction costs for the economically feasibility project, but marginal in terms of the financial viability. Government also provides guarantee support for the contingency liability to address the government obligation risk. It was also stated that land acquisition should have been provided by the government contracting agency before the implementation of

\(^5\) These five projects were Bandung Waste-to-Energy; Central Kalimantan Coal Railway; Umbulan Water Supply; Manggarai-Soekarno-Hatta Airport Raillink; and Central Java Coal Fired Power Plant.

\(^6\) The five showcase projects were: Umbulan Water Supply; Manggarai-Soekarno-Hatta Airport Raillink; Central Java Coal Fired Power Plant, Tanah Amo Cruise Terminal, and Medan-Kuala Namu-Tebingtinggi Toll Road.

\(^7\) Just recently announced in October 2013.
procurement of the business entity. In addition, in late 2010 Perpres 78/2010 and PMK 260/2010 have been issued regarding the provision of government guarantees for infrastructure projects implemented through PPP in the provision of infrastructure.

Furthermore, a memorandum of understanding between the two ministries and one agency, namely the Minister of Finance, Minister for National Development Planning / Head of Bappenas and the Head of investment coordination agency (BKPM) has been signed. This MoU aims to improve coordination facilitation and support implementation for the acceleration of PPP projects realization. In connection with the preparation of financing instruments and private Partnership Project, the Ministry of Finance has set up two state-owned companies, namely: PT SMI (Sarana Multi Infrastructure) and PT PII (Penjaminan Infrastruktur Indonesia), as well as the Government Investment Center (PIP).

In September 2011 the government has further refined the cross-sector regulatory framework with the second amendment of Perpres 67/2005 with Perpres 56/2011. Further amendment of Perpres 67/2005 was announced recently in October 2013 under Perpres 66/2013.

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18 The provisions that has been refined in Perpres 13/2010 were about the definition of the contracting agencies; government support and government guarantee, scope of infrastructure; procurement of business entity; transfer of stocks; definition of financial close; unsolicited projects; and transition provision.

19 Perpres 78/2010 on Infrastructure Guarantee for PPP Projects which will be provided through State Owned Enterprise in charge of Infrastructure Guarantee; Minister of Finance regulation (PMK) 260/2010 on Guidelines for the Implementation of Infrastructure Guarantee for PPP Projects.

20 PT SMI is expected to play two important roles: first, as a catalyst role in terms of co-financing with commercial lenders to provide longer term debt; and second as a pioneering role in the sense of taking risks on projects that commercial lenders are less willing to assume. To carry out its function, PT SMI established a subsidiary company, PT IIF (Indonesia Infrastructure Finance) with PT SMI and international financing institutions (IFC, ADB, DEG) as the shareholders in order to enhance the ability to facilitate financing capital intensive PPP projects. PT PII was established with the purpose of promoting credit enhancements of PPP infrastructure projects and improving the management of government contingent liability to protect the APBN from the sudden obligation arises from government guarantee for PPP projects. While PIP provides facilitation of upfront financing for land acquisition.

21 The second amendment of Perpres 67/2005 puts forward new and/or additional provisions on the subject matters related to the designation of Bappenas to publish PPP Book, allowing foreign companies to initiate unsolicited proposals for PPP projects, improving further on government support, dealing with the cost of project preparation, the establishment of a business entity or company by a foreign company’s preferred bidder, the prevailing language for dispute resolution, the procedure for unsolicited proposals at the procurement plan, and dealing with the requirements for Single Bidder appointment.

22 The third amendment of Perpres 67/2005 deals with the issue of allowing the preferred bidder to request for extension of reaching financial close from the required one year to up to maximum two years provided that the preferred bidder has shown convincing evidences that they have attempted very hard to reach financial close.
In addition, improvements in the institutional framework are also initiated by the Government to strengthen KKPPI with Perpres 12/2011 of which the membership of KKPPI is expanded to include Minister of Forestry, Minister of Environment, Head of BKPM and Head of BPN. Meanwhile in 2012, Law 2/2012 regarding Land Procurement for Development serving the Public Interest has been enacted, and equipped with PP 71/2012 on the Implementation of Land Acquisition for Public Interest Development, Permendagri 72/2012 on the Operating Costs and the Cost of Supporting Implementation of Land Procurement for Development serving the Public Interest Originating from the Regional Budget (APBD), and Minister of Finance Regulation (PMK 13/2013) on the Operating Costs and the Cost of Supporting Implementation of Land Procurement for Development serving the Public Interest Originating from the state budget (APBN). In the environmental sector, the government issued Government Regulation (PP 27/2012) on the Environmental Permit which replaces the Government Regulation (PP 27/1999) on the Environmental Impact Assessment. In the fiscal sector, Finance Minister Regulation (PMK 223/2012) on the Feasibility Support for Part of the Construction Costs of the PPP projects in the Provision of Infrastructure is published to complement the government support in the form of viability gap fund (VGF). In addition, the Minister for National Development Planning/Head of Bappenas has issued Permen PPN 3/2012 on the Operational Guidelines Manual for the Implementation of PPP in Infrastructure Provision and Permen PPN 6/2012 on the Procedures for the Making of the List of Infrastructure Project Plan.

Considering that there are already quite a lot of progress which has been made by the government in the implementation of infrastructure reforms, particularly in the process of perfecting the PPP frameworks in terms of both policy, regulatory and institutional arrangements, it is very unfortunate that the reality shows that the PPP is still not yet managed to provide a substantial contribution in reducing the infrastructure deficit in Indonesia. Why Indonesia is still struggling in the PPP program implementation, while some other developing countries such as Colombia, Peru, Brazil, the Philippines, India and South Africa which began more or less at the same time with Indonesia have shown real and meaningful progress? (Castalia, 2009)

Of international experience, the success of the PPP program is determined by a number of factors:

1. Understanding of the concepts and principles of PPP, especially regarding economic fundamentals of PPP, the feasibility (viability) and affordability;
2. Stable political commitment;
3. The capacity of the public sector to manage PPPs which they are responsible;

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23This study compares the implementation of PPP program in Indonesia with the countries designated as benchmark which are Colombia, Filippines, Netherlands and South Africa.
4. Policy, regulatory and institutional frameworks in the implementation of PPP are clear, predictable and credible;
5. Realistic risk sharing in order to obtain value for money, and
6. Public consultation to ensure buy-in or support acceptance of the stakeholders.

Most of the public officials of the agency in charge of PPP projects not properly understand the fundamentals consideration for any project that requires the PPP project concession must have commercial value as measured in terms of the feasibility of legal, technical, economic and financial. Moreover, the principle of affordability must also be met in terms of readiness in charge partnership project in order to be able to meet its obligations to provide direct support, both fiscal (budget for land acquisition and/or part of construction) and non-fiscal (licensing, tax breaks, and competent management team for PPP project) as well as government guarantees in connection with the agreed risk sharing.

These requirements have implications for the role of government in charge of PPP project to first doing proper due diligence in the preparation of any PPP project. Reality in Indonesia shows one of the main factors that hinder the progress of the implementation of PPP projects is the lack of quality of the project preparation which causes most produce projects that are not bankable. Adequate preparation (feasibility study and structuring) is often sacrificed in the rush to tender out projects, resulting in poor market response and delays later on, or if the concession was awarded to the winning bidder company, the project would never been realized because the quality of the PPP agreement is far below international standards. Development costs for PPP projects are substantial, therefore well-prepared projects can reduce development costs for both the government and the private sector.

6. The Conflicting Perspectives of Decentralization

Decentralization was intended to bring about greater democracy, greater community participation, greater equity in the development process and participation in the economy and more responsive services. It was intended to put government finance closer to where they were needed most so they could be applied more efficiently to

24 Fiscal government support if needed to enhance a PPP project which is economically feasible in terms of providing greatest benefits to the community, but the financial viability is marginal.
25 Indirect government support in terms of government guarantee which can be provided only by central government (Ministry of Finance) is needed to produce bankable PPP projects.
26 For example lack of bidders’ interest is found among others in Raillink Projects, which has conducted pre-qualifications three times, even it still need retender because due to lack of producing quality outline business case making the project difficult to obtain government guarantee. Other examples there are some toll road projects when they are offered not a single investor interested.
27 For example 24 toll road projects which are constrained in their development. Even when some toll road projects have reached financial close but land has not been acquired due to the fact that they don’t have sufficient equity fund causing borrowings from bank syndication can not be disbursed to start construction.
improve services such as infrastructure. Therefore, the logic of decentralization is to make governance at the local levels more responsive to the need of the local people. Has that happened?

It has been widely recognized that there is now less equity of capacity of local government’s to deliver services. It is particularly due to the distorting formulations for the general block grant (DAU) to provincial and local governments, the reservation of funds for special areas, the reservation of funds for negotiated settlement between central and local government, transfer of central government’s earners, and even the provision of some compensatory measures. The per capita DAU plus other sources of income is 50 to 1 from the richer to poorer local governments. Basically the resource-rich with the resource-based industries and direct income from resource usage are also the bigger recipient of central government funding support. The ratio of the net discretionary funds effectively becomes 400 to 1 if it is adjusted for unit costs and the inefficiency of providing services in low density areas. It is going to take several years and probably a new electoral mandate before the impacts are fully appreciated and dealt with. In the meantime many local governments have large excess revenue, but very many more have only a small amount of funds to spend beyond their wages bill. This is a pretty rigid situation and we have limited tools to tackle it.

In order to achieve rigorous fiscal management, the ministry of Finance has decided not to provide for lending to local governments since the crisis, and that is still in effect. From one perspective this is prudent, but it also means that even the more entrepreneurial local governments cannot tackle the backlog of deficiencies in infrastructure by borrowing in anticipation of direct and improved indirect cost recovery in the future. That means that the moderately priced official lending with long grace periods that would help Indonesia get past the point of recovery from the crisis cannot be applied to local governments since they cannot borrow, and the central government cannot spend on their behalf in these areas.

This legacy impact of decentralization and the uneven competition for national financial resources on the capacity of the government to manage reforms in infrastructure is the dominant factor constraining public infrastructure investment and a major factor in slowing progress on some categories of private sector investment. The practical effects are more readily observed in the roads sub-sector. Central government agencies work, with some support from provincial governments to try to stop massive overloading on the national road system. Trade ministries allow the import of high axle load trucks because there are financial benefits to the industries that lobby them. Heavily loaded trucks take shortcuts across kabupaten inroads, sometimes to avoid checks, sometimes because it’s just a shortcut. This damages kabupaten roads, often ones which are not particularly important to that kabupaten. Local governments prefer to fund things which are more noticeable to their communities, which is natural. This is another series of unintended consequences in decentralization, and in central government practices that is causing major infrastructure costs, and also of course affecting the truck owners who are part of the problem.
Basically, the Big Bang decentralization in Indonesia and its hasty preparation have left much unfinished business. There are five major issues that need to be addressed, i.e.:

a) The lack of consensus on the vision of the decentralized government;
b) The lack of clarity on the division of power, functions and responsibilities among central, provincial and local governments;
c) The need for strengthening human and institutional capacity of local governments;
d) The need for improving the structure of decentralized public finance, and
e) The need for reinforcing local accountability.

From the earlier description about decentralization, we know that decentralization increase the local government responsibilities primarily in the provision of public goods and economic development, especially in the infrastructure sector. In the context of decentralization and regional autonomy, many of the functions and responsibilities related to infrastructure provision and services that were previously handled by central sector departments have been devolved to local governments. The actual magnitude of the changes has varied considerably between sectors. In the case of telecommunications, the scope of decentralized authority is very limited, while sub-sectors such as power, ports and airports as well as road networks and road transport have devolved considerable responsibilities to the regions (Soedjito, 2004a). However, the ability of the local government to build and improve the implementation of infrastructure development is very limited. This is caused by the limited financial and human resources capabilities, furthermore local governments are also faced with dynamic and competitive business situation due to globalization.

The limitation of financial capacity of regional infrastructure development in the era of decentralization is affected by the limitations of the role of local revenue (PAD) against APBD. Wibowo in his study entitled "Effectiveness of Fiscal Decentralization Study of Regional Economic Performance" points out that in the decentralization era, fiscal capacity of the local government has decreased (Wibowo, 2004). The average contribution PAD to total revenue before the decentralization era was 10.2%, and then down to 8.1%. However, when seen from its nominal value of revenues following fiscal decentralization increased by 170 percent. As we know that the main source of revenue before decentralization is retribution, then switch to local taxes. This raises an indication that in the era of decentralization, local governments are less able to provide public services, especially to build infrastructure. Therefore, the public private partnership in infrastructure development has become a necessity for almost all local governments which have limitations in their financing capacity. However, the adoption of “trial and error” approach in implementing decentralization policy (Miharja, 2009) and the lack of adequate enabling environment to serve the needs of investors (Pudjianto, 2009) have constrained the ability of local governments to carry out PPP in infrastructure development.

7. The Need for Harmonizing the Procurement Regulations
There are four types of procurement approaches in infrastructure investment: (1) for the public investment project, the procurement is usually done through public tendering or government procurement; (2) for private investment in public infrastructure project, the procurement is typically carried out through public private partnership scheme; (3) for the state-owned enterprise normally deals with strategic infrastructure, the procurement is mostly executed through direct appointment by the government; and (4) for fully private sector investment, the procurement is intended to promote fair and open competition for their business while minimizing exposure to fraud and collusion.

Government procurement, also called public tendering or public procurement is the procurement of goods and services on behalf of a public authority, such as a government agency. With 10 to 15% of GDP in developed countries, and up to 20% in developing countries, government procurement accounts for a substantial part of the global economy. To prevent fraud, waste, corruption or local protectionism, the law of most countries regulates government procurement more or less closely. It usually requires the procuring authority to issue public tenders if the value of the procurement exceeds a certain threshold.28

Indonesia spends, on average, more than one-third (33%) of the government budget acquiring needed public goods and services. A majority of all Indonesian civil servants are familiar with the basic steps in the public procurement process governed by Presidential Decree (Keppres) 80/2003, as replaced recently by Perpres 54/201029.

In a typical public-sector procurement, the government contracting agency (GCA) sets out the specifications and design of the Facility, calls for bids on the basis of this detailed design, and pays for construction of the Facility by a private-sector contractor. The GCA has to fund the full cost of construction, including any cost overruns. Operation and maintenance of the Facility are entirely handled by the GCA, and the contractor takes no responsibility for the long-term performance of the Facility after the (relatively short) construction-warranty period has expired.

In a PPP, on the other hand, the GCA specifies its requirements in terms of ‘outputs’, which set out the public services which the Facility is intended to provide, but which do not specify how these are to be provided. It is then left to the private sector to design, finance, build and operate the Facility to meet these long-term output specifications. The Project Company receives payments (‘Service Fees’) over the life

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28 Procurement is defined broadly as the overarching function that describes the activities and processes to acquire goods and services. Importantly, procurement involves the activities involved in establishing fundamental requirements, sourcing activities such as market research and vendor evaluation and negotiation of contracts. It can also include the purchasing activities required to order and receive goods. In other words, procurement is the acquisition of goods, services or works from an external source. It is favourable that the goods, services or works are appropriate and that they are procured at the best possible cost to meet the needs of the purchaser in terms of quality and quantity, time, and location. Corporations and public bodies often define processes intended to promote fair and open competition for their business while minimizing exposure to fraud and collusion (Weele, 2010).

29 Perpres 54/2010 on Government Procurement of Goods and Services has been amended twice with Perpres 35/2011 and Perpres 70/2012.
of the PPP Contract (perhaps 25 years on average), on a pre-agreed basis, which are intended to repay the financing costs and give a return to investors. The Service Fees are subject to deductions for failure to meet output specifications, and there is generally no extra allowance for cost overruns which occur during construction or in operation of the Facility. The result of this PPP approach is that significant risks relating to:

- the costs of design and construction of the Facility, and
- market demand for the Facility (usage), or
- service provided by the Facility (including its availability for use), and
- the Facility’s operation and maintenance costs,

are transferred from the GCA, the public sector, to the Project Company, the private sector.

The PPP procurement in Indonesia is governed by three main regulations, i.e.:


b) Government Regulation (PP) 6/2006 as amended by PP 38/2008 on the Management of State and Regional Assets for coping with brownfield projects; and

c) Government Regulation (PP) 50/2007 on the Procedures of Regional Cooperation for managing cooperation between regional (provincial/regency/municipality) government with a third party (including the private financing in public infrastructure).

Although both Perpres 67/2005 and PP 6/2006 have adopted the principles of transparency and competitive bidding, their objectives are quite different. On the one hand, the objectives of Perpres 67/2005 are fourfold, namely: (a) to adequately provide sustainable funding needs for infrastructure investments through the mobilization of private financing; (b) to improve the quantity, quality and efficiency of infrastructure services by way of fair competition; (c) to enhance the management and maintenance of infrastructure facility; and (d) to encourage the use of user pay principle while considering the user ability to pay. On the other hand, Perpres 6/2006 aims to increase non-tax revenue of the state/regional earnings and other sources of financing. Meanwhile PP 50/2007 is designed to be used by the regional governments.

30 Governments believe that private provision of public infrastructure has the potential to offer better value-for-money compared to conventional approaches, for the followings reasons:

- Firstly, the integration of design, construction, operation and maintenance over the life of an asset, allows for greater innovation from the private sector to reduce its whole-life costs. Innovation is expected by the Government who will specify what it wants in terms of outputs and quality of service. A whole-life approach also ensures that the infrastructure asset will be better maintained throughout its life, which is not always the case under direct Government management, where maintenance needs are not always top of the priority list.
- Secondly, risk transfer to the private sector, who is better placed than government to manage certain risks, can lead to a better delivery of infrastructure. Strong incentives can be provided with a performance/output based contract linked to a payment regime.
governments in their cooperation with the private sector either for greenfield (consistent with Perpres 67/2005) or brownfield infrastructure projects (coherent with PP 6/2006).\textsuperscript{31}

The procurement procedures carried out by the state-owned enterprises (SOEs), as governed by Law 19/2003 on the State-Owned Enterprises, is simpler and less time consuming than the government procurement or public tendering. This is due to the fact that SOEs according to the Law operate as private business entities, although the Government is still one of the main shareholders. As SOEs are required to adopt good corporate governance principles in their operation, the procurement procedures must also assume the notion of transparency and fair competitive bidding. The direct appointment of SOEs to execute public infrastructure projects is typically associated with the strategic nature of the respective project. When a SOE participates in a PPP project, to ascertain a level playing field, the respective SOE will be treated as a private business entity. However, the private sector believes that the participation of SOEs in PPP projects has not been adequately addressed in the PPP regulatory framework.

When implementing public-private partnerships, governments need to adopt a lifecycle perspective. Success depends, in great part, on a government’s capacity to execute and manage innovative partnerships and the procurement process that take into account all phases of the PPP life-cycle. Based on the findings of the requirements of the various key processes involved in the PPP project cycle, it is important to improve the efficiency in terms of time and cost saving in performing the key processes of requesting government support, of government guarantee, of environmental impact assessment, and of land acquisition with the process of developing, preparing, transacting PPP project and managing the PPP contract.

\textsuperscript{31} With respect to the management of regional assets, the Ministry of Home Affairs has issued a Minister of Home Affairs Regulation (Permendagri) 17/2007 regarding the Technical Guidelines for the Management of Regional Assets.
Figure 7.1 The Integration of the Four-Phases of PPP Project Cycle with (i) Environmental Assessment; (ii) Land Acquisition; (iii) Government Support (VGF) and (iv) Government Guarantee.
<table>
<thead>
<tr>
<th>Phases</th>
<th>PPP Project Planning</th>
<th>PPP Project Preparation</th>
<th>PPP Project Transaction</th>
<th>Management of the PPP Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Identification &amp; Selection</td>
<td>Prioritisation</td>
<td>Outline Business Case</td>
<td>Project Readiness</td>
</tr>
<tr>
<td>Process of the Request for Acquiring Government Guarantee</td>
<td>Identification of the need for Government Guarantee</td>
<td>GCA submits list of PPP Project Priorities to Minister of Planning/Bappenas</td>
<td>GCA submits PPP project preparation</td>
<td>GCA conducts PPP project preparation</td>
</tr>
<tr>
<td>Development and Publication of the PPP Book</td>
<td>• GCA submits list of PPP Project Priorities to Minister of Planning/Bappenas</td>
<td>• Minister of Planning reviews and approves the proposed PPP project in the list based on the respective criteria as established in the OGM.</td>
<td>• GCA submits a request to the Ministry of Planning for a final decision on the status of the proposed project as a PPP project under the category of Prospective Project, by providing the required Project Preparation Document that incorporate the outline of the project readiness and the assessment of the project readiness.</td>
<td>• GCA submits a request to the Ministry of Planning for a final decision on the status of the proposed project as a PPP project under the category of Prospective Project, by providing the required Project Preparation Document that incorporate the outline of the project readiness and the assessment of the project readiness.</td>
</tr>
</tbody>
</table>

Figure 7.1 summarizes in great detail the integration of the four-phases of PPP project cycle, as adopted by Permen PPN 3/2012, with the requirements of environmental assessment, land acquisition and resettlement plan, government support (including VGF) and government guarantee. The last row is added as to link all of these key processes within the PPP project cycle with the process of screening projects proposed by the GCAs to be listed in the PPP Book.

Most GCAs are reluctant to implement PPP, because PPPs are complex and relatively inflexible structures. Table 7.1 attests that PPP procurement and implementation can be lengthy and costly, making it unsuitable for some projects. The indicative timeline makes obvious that the processes of PPP implementation from planning to contract signing need 26 to 34 months to complete, including 4 months each required for consultants procurement to perform project preparation and for project transaction respectively, and 10-23 months required for business entity procurement. Moreover, the overall process of PPP implementation requires the carrying out of different procurement regulations. On the one hand, the GCA is responsible to recruit consultants and to procure the business entity. For the procurement of consultants for project preparation and transaction, the GCA must apply the public procurement governed by Perpres 54/2010 and its amendments due to the source of financing for the procurement comes from the state budget (APBN) or regional budget (APBD) and the project development facility (PDF). As for the procurement of the business entity, the GCA has to employ the PPP procurement governed by Perpres 67/2005 and its amendments. While the due diligence for providing guarantee carried out by the IIGF (PT PII) for screening, appraisal and structuring of the PPP project proposed by the GCA, sometimes they have to recruit consultants to do the job. The procurement of the consultant by PT PPI as a state-owned enterprise needs to follow the procurement process as governed by Law 19/2003 on the State Owned Enterprises. And lastly, the special purpose corporation who is responsible for constructing and operating the project must also carry out private procurement process for selecting contractor and operator.

32 To provide the basic information GCAs need in order to identify, screen, prioritize, prepare and tender PPP projects, Bappenas has designed an operational guidelines manual for the implementation of PPP in infrastructure provision (the OGM) based on the four phase of PPP life cycle (planning-preparation-transaction-contract management). The OGM is issued as an attachment to Permen PPN 3/2012, and is intended to make the PPP concept easier to understand and thereby help the Government of Indonesia to accelerate the development of needed infrastructure and related facilities for Indonesia.

33 In addition, PPPs place additional responsibility on the public sector, which must be prepared to act as a competent counterpart and regulator. This may require a different set of government proficiencies (i.e., managers skilled in negotiation, contract management and risk analysis).

34 The GCAs should seek advice from outside consultants to help them design PPP programs and projects that will achieve their intended objectives, while also increasing their value for money. To speed up the procurement process, it is advised to use the indefinite delivery contract (the IDC) scheme.

35 PDF provides fund for the GCAs to develop PPP project, especially for project preparation and transaction. The PDF is managed by the Ministry of Finance.
Considering the complexity of the procurement process in the implementation of PPP project, it is necessary to simplify the process by harmonizing the current various procurement regulations. It is therefore we need to support the initiative of the Government by assigning the Institute of Policy on Government Procurement for Goods and Services (LKPP) to draw up a draft law on procurement. It is timely for LKPP when drafting the procurement law to start making an attempt to harmonize the different procurement regulations currently used by the public and private sector.

8. Closing Remarks

The effectiveness of policy reform implementation is largely determined by the quality and commitment of government leaders. The ability to build infrastructure is a transformation and reformation continuous process (see Figure 8.1). This ability also requires changes and adaptation continuously. Strong leadership - and the strategic vision - is needed to anticipate the changes and adjustments for such changes. Thus, the implementation of the PPP which is an integral part in the process of transformation in the infrastructure sector requires stable and sustainable political commitment. Not only requires a strong champion, which means strong political leadership at the highest level, but also the good and sufficient governance to improve the effectiveness of coordination.

In Indonesia, the lack of experience and capacity of the public sector in charge of PPP project (the government contracting agency) in understanding the PPP and PPP procurement process, produce poor quality of PPP project preparation. Almost all the contracting agencies which have responsibility for PPP projects, both at national (ministries) and at regional, they do not have designated working groups that have adequate experience and that focus on duties and functions for the development and implementation of PPP. PPP nodes designed as implementing units of the PPP institutional framework have not yet been formed. There are usually ad hoc units, with staffs who do not have adequate skills and competences in preparing PPP Project and also not supported by an adequate budget.

The contracting agencies have not realized that preparing PPP projects, which is different from the preparation of public sector construction projects, need knowledge, skills, different qualifications and competencies. And it requires a change of mind set. The PPP development and implementation put the public sector with additional responsibility to act as competent partners and regulators. Considering that competency is not owned by most contracting agencies, they need to look for advisory services from consultants to design the PPP program and projects to achieve the desired goals while at the same time increase the value for money from PPP implementation.

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37 Changing mind set means a changing paradigm in preparation pattern and project implementation from a state and local budget (APBN/APBD) to a preparation pattern and transaction of cooperation project by means of private project financing approach.
The stakeholders involved in the PPP implementation tend not to trust each other, but their interests need to be aligned so that the PPP can be implemented as quickly as possible. PPP could lead to the imposition of higher tariffs when accompanied with policies to reduce or eliminate subsidies. This condition should not be a direct consequence of the PPP implementation scheme, but for the public as users of infrastructure services, private sector involvement in infrastructure provision is often perceived as the cause of the increasing tariff as the result of private sector interest to earn a decent return on its investment. To obtain certainty of approval support from the stakeholder is indeed necessary for achieving the successful of PPP project implementation.

Figure 8.1 The Continuous Transformation and Reformation Process in Infrastructure Development

Source: Analysis, 2013.

38 The stakeholders are users, government (PJPK), private investor, and lenders. According to Alfredo E. Pascual, Advisor (Public-Private Partnership), Southeast Asia Department of the Asian Development Bank on his presentation on the First IRSA International Institute, Bandung, 1-3 November 2007 titled “Private Investment in Infrastructure: Making PPP Work,” stated that leadership from each stakeholders was as follow: “Users: want timely, quality, and affordable service; Government: wants to delivery needed public service and be protected against personal liabilities; 
Private investors: want policy predictability, a level playing field, low transaction costs, and fair rates of return; and, Lenders: want timely recovery of their loans, inclusive of interest.”
The principle of partnership does not mean just in terms of mutually dependent, mutually supportive, and mutually beneficial, but more than that that each party, government and private, agree to conduct a realistic and sensible risk sharing with adhering to the principle of risk to be allocated to the best party able to bear and manage risk with the lowest cost. In PPP, the optimum allocation of risk does not necessarily mean transferring maximum risk to the business entity. The lack of understanding of risk by public officials often lead to erroneous interpretation, so as if by the application of the PPP scheme all the risks transferred to the private sector. Reasonable allocation of risk will provide an incentive to businesses to provide services better infrastructure and cost effective, because it will create value for money for all parties.

Involving the private sector in infrastructure provision is more complicated than what people expected and requires a degree of sophistication on the part of the government that takes time and experience to develop and implement PPP. In certain cases, the responsibility of the government to direct the provision of infrastructure through the PPP process became even greater than when the system is fully implemented through public investment. This is due to the fact that adding private component into the infrastructure network would demand government readiness to deal with the management and design issues which are quite complex, including economic and technical issues as well as issues that are sensitive in the social and political domains. Consequently private participation in partnership projects always involve the government at every stage of the project life cycle starting from planning, preparation and transactions, procurement the business entity and finalization of agreements, up to construction and operation.

Indonesia requires an institution that not only possesses and equipped with technical capabilities and expertise but also has weighty political authority for strategic planning and effective co-ordination center. Various measures relating to the development and implementation of PPP cannot be left to handle only by technocrats. Politicians must play a meaningful role. Strong political leadership will be able to "pull things together" and able to overcome resistance to the implementation of PPP in the provision of public infrastructure. PPP is not just an ad hoc solution, but rather a long-term solution, and therefore its implementation needs to be internalized and formalized into government organizations.

And as a closing note, it must be confirmed that for preparing the infrastructure projects it must be ensured that it would generate the greatest socio-economic benefits and sustainability of environmental quality for the public. And the appropriate analytical tool to be used is the social cost benefit analysis (SCBA) which is very different from the common cost benefit analysis (CBA). And subsequently the financial feasibility is analyzed to determine the source of financing and procurement process.
Not all infrastructure projects can be implemented through the PPP scheme. Only projects that have economic viability, in the sense of producing a great benefit socially and financially viable with government support and guarantee that would be doable as a PPP project. And more importantly is that we have to ensure that when projects go to the market they are ready. Ready in two important sense of the word – that funding for government support has been obtained, and that the contracting agency has a clear view of the services it wants from the project and cost, so that there are no surprises when bids come in.

References

Books & Literatures


Not all projects are suitable for public-private partnerships, which should provide equivalent or better value for money than a 100 percent public sector approach. Value for money is a key driver in public-private partnerships. Value for money does not simply equate to selecting the cheapest bid or lowest price for an asset; it means opting for the best long-term solution for service delivery. Because PPPs generally allow payments to be spread the cost of the infrastructure investment over the lifetime of the asset, the public sector can move ahead with infrastructure projects without waiting for significant upfront capital. This allows the public to benefit from the investment much sooner than with traditional “pay-as-you-go” financing.

Laws & Regulations

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10. Law 18/2008 on Solid Waste Management.
36. Presidential Decree (Keppres) 64/2000 on Reassessment of Government, State-owned Enterprises and Private related to Government / State-owned Enterprises projects which was previously deferred or reassessed.
37. Presidential Decree (Keppres) 81/2001 on the Committee on Policy for Acceleration of Infrastructure Development.


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57. The Minister of Public Work Regulation (PermenPU) 13/2010 on the Guidelines for Undertaking the Development of Toll Road.


59. Ministry of Home Affairs Regulation (Permendagri) 72/2012 on Operational Costs and the Supporting Cost originating from the Local Budget (APBD) to Conduct Land Procurement for Development serving the Public Interest.


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TRANSPORT INFRASTRUCTURE AND THE ENVIRONMENT:
SUSTAINABLE MOBILITY AND URBANISM

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Abstract

The urban transportation sector’s environmental, economic, and social footprint is immense and expanding. Many of the world’s most vexing and pressing problems – fossil fuel dependency, global warming, poverty, and social exclusion – are inextricably tied to the transportation sector. Much of the blame for the transportation sector’s inordinate environmental footprint lies in the increasing automobile-dependency of cities. Rapid motorization unavoidably shifts future travel from the most sustainable modes -- public transport and non-motorized ones (walking and cycling) – to private vehicles. Despite growing concerns over energy futures, climate change, and access for the poor, public transport’s market share of trips is expected to erode over the next decade in all world regions if past trends (in how ownership and usage of the private car is priced and public financial resources are spent on transport infrastructure) continue. A paradigm shift is needed in how we think about transportation and its relationship to the city. The integration of transport infrastructure and urban development must be elevated in importance. In many cities of the Global South, recent Bus Rapid Transit (BRT) investments provide an unprecedented opportunity to do just that. To date, however, BRT systems have failed to leverage compact, mixed-use development due not only to little strategic station-area planning but also factors like siting lines and stations in stagnant urban districts and busy roadway medians. BRT systems are being conceived and designed as mobility investments rather than city-shaping ones. Given that the majority of future urban growth worldwide will be in intermediate-size cities well-suited for BRT investments, the opportunities for making these not only mobility investments but city-shaping investments as well should not be squandered. Transit-oriented development is but one of a number of built forms that hold considerable promise toward placing cities of the Global South on more sustainable mobility and urbanization pathways.

Keywords: Public Transport, Bus Rapid Transit, Land Use, Sustainability, Transit Oriented Development
1. Introduction

Urban areas, home to more than half of the world’s population, face unprecedented transport and mobility challenges. With rapid population and economic growth, demands for urban mobility are steadily rising. Globally, some 8 billion trips are made every day in cities of which nearly half (47%) are by private motorized modes, almost all of which are propelled by fossil fuels (Pourbaix, 2011). In 2050, there may be 3 to 4 times as many passenger-kilometers travelled as half a century earlier, infrastructure and energy prices permitting (International Transportation Forum, 2011).

Concurrent to rapid rates of motorization, more sustainable forms of transport like public and non-motorized transport face mounting challenges, especially in developing countries. Public transport and non-motorized modes, despite being the chief way many poor people get around, are fast losing customers to private cars in much of the world (Gakenheimer and Dimitriou, 2011). In 2005, walking and cycling accounted for only 37 percent and public transport 16 percent globally (Pourbaix, 2011). At the same time, informal modes of transport are proliferating to fill the gaps left by inadequate or non-existent public transport services.

The transportation sector is also inextricably linked to the climate-change challenge since it is currently responsible for 13 percent of Greenhouse Gas (GHG) emissions worldwide and 23 percent of total energy-related GHG emissions (UN Habitat, 2011). If recent trends hold, the sector’s share of global GHG emissions could reach 40 percent by 2050 (International Energy Agency, 2011). Fueling this increase is the growing demand for urban mobility. In the hundred-plus years of motor vehicles relying on gasoline as a fuel, the world has used approximately 1 trillion barrels of petroleum to move people, materials, and goods (Black, 2010). The transport sector’s share of global oil demand grew from 33 percent in 1971 to 47 percent in 2002 and by one account could reach 54 percent by 2030 if past trends hold (IFP Energy Nouvelles, 2012). With increasing motorization and investments in roads and highways, cities find themselves in a vicious cycle – reliance on the private car unleashes more sprawl and road building further increases reliance on the private car.

It is widely accepted that cities of the future must become more sustainable, and that the transportation sector has a major role to play in this regard. The idea of a paradigm shift in urban transport is gaining currency in many parts of the world, not only to de-carbonize its fuel supply but also to create cleaner, economically viable, and socially just cities of the future. In particular, a shift towards the design of more compact cities based on the inter-mixing of land uses that prioritize sustainable forms of mobility such as public transport and non-motorized movement is broadly advocated. The post-oil city of tomorrow will need to be one that allows people to easily get around by foot, two-wheelers, buses, and trains. It is also recognized that urban transportation systems needs
to be inclusive, providing mobility opportunities for all. In a car-dependent city, those without access to a private vehicle – often the poor, physically disabled, youth, elderly, or those forsaking car ownership out of choice – are unable to access opportunities and services. It will also be essential to enhance the pivotal role of transportation in the shaping the economic future of cities, in recognition that it is the transport sector that connects workers to jobs, raw materials to plants, produce and goods to markets, and people to retail shops and places of entertainment and recreation.

This paper discusses key challenges in advancing sustainable urban mobility in the 21st century, particularly in a developing cities context. Issues facing different modal options discussed, particularly with regard to public transport. Reforms needed to achieve sustainable urban mobility on multiple fronts – environmentally but also socially and economically – are also reviewed. The paper then shifts to a particularly important transport-infrastructure challenge: investment in BRT systems that not only enhance mobility but also promote more efficient, sustainable, and socially just urban forms. Experiences in three global cities are reviewed in this regard. The paper closes with commentary on the institutional challenges and social equity considerations of advancing the sustainable mobility agenda.

2. Urbanization and Motorization

Since the mid-half of the last century, rapid urbanization has been accompanied by urban sprawl. Spread-out patterns of growth carry high costs. It not only increase automobile dependence but also consume farmland and open space, threaten estuaries and natural habitats, and burden municipal treasuries with the high costs of expanding urban infrastructure and services.

From 1995 to 2005, 85 percent of the 78 largest cities in the developed world experienced a faster growth in their suburban belts than their urban cores (UN Habitat, 2011). In Bangkok and Jakarta, 53 and 77 percent of urban growth by 2025, respectively, is expected to be in peri-urban regions (Angel, 2011). In Greater Cairo and Mexico City, sprawl is fueled mostly by informal housing settlements while on the outskirts of Mumbai and Delhi new towns and employment sub-centers have been the largest consumers of once exurban land. Sprawl in China is partly induced by local government policy wherein municipalities buy agriculture land at low prices, add infrastructure and services, and then lease to developers at much higher prices – effectively practicing value capture as a revenue generating tool.

Urbanization has both encouraged and been shaped by the growth in motorized movements in cities. The global count of motorized vehicles has been increasing at unprecedented rates. In 2010, there were nearly 1.2 billion passenger vehicles worldwide (UN Habitat, 2011; Wright and Fulton, 2005). Based on data from five years earlier,
nearly half of all urban trips were by private motorized modes, a figure that continues to climb (Pourbaix, 2011). A key factor contributing to rising motorization in both developed and developing countries is the availability of fairly cheap oil which has literally and figuratively fueled low-density development. In China, urban growth is occurring as far as 150km to 300km from the core of cities. A recent study of Shanghai residents who were relocated from the compact, mixed-use, highly walkable urban core to isolated residential towers on the periphery found dramatic shifts from non-motorized to motorized modes, accompanied by substantial increases in travel duration and vehicle-kilometers-traveled (VKT) (Cervero and Day, 2008). Economic growth and rising incomes have also triggered motorization. From 2002 to 2007, China’s per capita incomes almost doubled and car ownership nearly tripled. Societal values also play a role given that for many who join the ranks of the middle class in rapidly emerging economies, owning a car is a rite of passage.

Rapid motorization unavoidably shifts future travel from the most sustainable modes -- public transport and non-motorized ones (walking and cycling) -- to private vehicles. Daily trips in urban areas by private cars are projected to jump from 3.5 billion in 2005 to 6.2 billion in 2025, an 80 percent rise (Pourbaix, 2011). Much of this growth will be in developing countries. If past trends continue, petroleum consumption and greenhouse gas emissions are projected to increase by 30 percent, matched by a similar growth in traffic fatalities. While they provide tremendous mobility benefits to those who cannot afford a car, motorcycles, which are the dominant mode of transport in many Asian countries, come at a high cost. Besides congesting city streets, they can be exceedingly loud, contribute to traffic accidents, and when powered by two-stroke engines, spew dirty tailpipe emissions. A poorly tuned two-stroke engine, for example, can emit 10 times as hydro-carbons and particulate matter as a four-stroke engine or private car (Badami, 1998; World Bank, 2002).

Motorization is also marked by environmental justice concerns given the growing international trade of old second-hand vehicles from high-income to low-income countries. Over 80 percent of the vehicle stock in Peru was originally imported as used vehicles from the United States or Japan (Davis and Kahn, 2011). In many African countries, import liberalization policies from the 1990s made it easier and cheaper for households to buy second-hand vehicles shipped across the Mediterranean Sea from Europe.

3. Mobility and Modality

Challenges faced by the two most resourceful forms of mobility -- public transport and non-motorized transport -- are reviewed in this section. Being pro-transit, pro-walking, and pro-cycling means not only enhancing the service quality of these options but also removing the many built-in subsidies and incentives that promote auto-mobility.
3.1 Public Transport

In 2005, 16 percent of the roughly 7.5 billion trips made in urban areas worldwide were by some form of public transport (i.e., formal, institutionally recognized services, such as local buses and rail transit) (Pourbaix, 2011). Public transport’s mobility role varies widely, accounting for 45 percent of urban trips in Eastern Europe and Asia, 10 to 20 percent in much of Western Europe and Latin America, and less than 5 percent in North America and Sub-Saharan Africa (where informal services dominate the mass transit sector) (UITP, 2006).

In cities of the developing world, the mobility role of public transport also varies markedly, particularly among African cities. Only a handful of Sub-Saharan Africa cities, such as Addis Ababa, Abidjan, and Ouagadougou, have reasonably well-developed, institutionalized forms of local bus services that are of a high enough quality to capture 25 to 35 percent of motorized trips. In most other parts of Sub-Saharan Africa, private paratransit and informal operators dominate, with local buses serving but a small fraction of trips, if any. In Sub-Saharan Africa as well as poorer parts of South and Southeast Asia, government-sponsored transit is either inadequate or non-existent, mainly because governments are too cash-strapped and under-staffed to mount and sustain effective and reliable mass transit services.

In Southeast Asia, conventional 50-passenger buses are the workhorse of the public transport networks of most cities. In Bangkok, 50 percent of passenger trips are by bus, rising to 75 percent during peak hours. In East Asia, buses serve slightly larger shares of mechanized trips than metrorail in Taipei (14.4 versus 12.9 percent) and Shanghai (12.9 percent versus 5.7 percent) whereas metrorail is more dominant in Hong Kong (35.5 percent of mechanized trips), Seoul (34.8 percent), and greater Tokyo (57 percent). Buses similarly predominate throughout Latin America, even in rail-served cities like São Paulo, Santiago, and Buenos Aires. When buses operate on exclusive dedicated lanes, they tend to gain even more popularity by mimicking the speed advantages of metros however usually at a fraction of the construction cost. As discussed later, the most extensive Bus Rapid Transit (BRT) networks are today found in Latin America.

In many parts of Asia, Africa, and Latin America, the informal transport sector serves the mobility needs of most people. The lack of affordable and accessible public transport systems in developing countries has led to the proliferation of informal operators, such as private microbus and minibus services. These modes help fill service gaps but can also worsen traffic congestion and air quality. In some settings, informal carriers are the only forms of mass transport available. In India, for example, only about 100 of the more than 5,000 cities and towns have formal public transport. Everything from hand-pushed rickshaws to private minibuses have stepped in to fill the gap.
3.2 Non-Motorized Transport

Walking and bicycling are the healthiest, least intrusive, and most affordable forms of movement. In 2005, 37 percent of urban trips worldwide were made by foot or bicycle, the two predominant forms of non-motorized transport (NMT). In African cities, 30 to 35 percent of all trips are by walking but in some cities, like Dakar and Douala, the share is much higher, over 60 percent (Montgomery and Roberts, 2008). In general, the poorer and smaller the city, the more important NMT becomes, capturing as many as 90 percent of total person trips. In densely packed urban cores, NMT provides access to places that motorized modes cannot reach and are often the fastest means of getting around. Among South Asia’s densest, most congested cities, more than half of all passenger and goods trips are by foot, bicycles, and rickshaw.

Walking is often the only form of transport for the very poor. Many people from the developing world are “captive walkers”, meaning that they cannot afford an alternative. For them, having a well-connected and safe pedestrian environment is critical to meeting their daily needs. As the least expensive form of mobility, walking allows the very poor to allocate income for other purposes, thus helping to reduce poverty. It also promotes physical fitness, provides feeder access to bus and rail stops, and enhances security by providing “eyes on the street”.

Cycling’s mobility role contrasts sharply among the world cities. In general, the lower the per capita income, the bigger the mobility role played by bicycles however when high-quality cycling infrastructure is provided, bicycles can be a prevalent mode in even well-to-do cities. Today, bicycles are used for more than 40 percent of trips in some Dutch and Danish cities. Historically bicycles have also played a prominent mobility role in Chinese cities but today their use is in rapid decline, partly due to motorization but also government policies. In Beijing, for example, it is still illegal to park bicycles in front of many modern office buildings yet cars can be parked nearby. Bicycle lanes have been taken away in cities like Guangzhou and Shenzhen to make way for motorists. Shanghai and Nanjing officials recently announced the goal of cutting bicycle trips in half.

In some of the poorest cities of the world, bicycles serve as “mass transport”, in the form of rickshaws. Cycle rickshaws are found all over Bangladesh, India, Pakistan, and Sri Lanka. They are particularly important modes for women and children. In Dhaka, around 40 percent of school trips are by rickshaw (Jain, 2011). Rickshaw pulling is often the first job for many rural migrants in cities of South Asia. In Dhaka, 20 percent of the population, or 2.5 million people, rely on rickshaw pulling for their livelihood, directly or indirectly (Jain, 2011). Still, the vehicles are being banned for slowing motorized traffic and a belief that they detract from the city’s image as a modern metropolis.
4. Immobility: Traffic Congestion

Traffic congestion is an unwanted by-product of widespread, or what some might call “excess”, mobility in cities around the world. A recent study in 20 cities across six continents revealed that traffic congestion levels markedly worsened during the 2007-2010 period (IBM, 2010). Moscow motorists reported the worst commute, with an average daily delay of two and a half hours. With a 24 percent annual growth rate in registered vehicles, traffic conditions are deteriorating most rapidly in Beijing according to 95 percent of surveyed residents.

Congestion has widespread impacts on urban quality of life, consumption of fossil fuels, air pollution and economic growth and prosperity. World Bank (1994) studies from the 1990s estimated that traffic congestion lowered GDP of cities in the range of 3 to 6 percent, with the higher value applying mostly to rapidly growing cities (e.g., places with busy port traffic, reliance on just-in-time inventorying and manufacturing, and other time-sensitive activities). Time losses from traffic congestion are estimated to comprise 2 percent of GDP in Europe and 2 to 5 percent in Asia. The hidden external costs of traffic congestion in Metro Manila, Dakar, and Abidjan have been pegged at nearly 5 percent of those cities’ GDPs (Chin, 2011). Such costs not only exact a burden on the present generation but also commit future generations to long-term debts, which can eventually slow global growth.

Limited road capacity in the face of growing demand for motorized mobility partly explains deteriorating traffic conditions. The nature of the problem, however, varies markedly across the globe. Less than 10 percent of land area is devoted to roads in many developing country cities (e.g., Kolkata, Jakarta, Nairobi) (Vasconcellos, 1999). This contrasts with 15 to 20 percent in many rapidly emerging economies (e.g., Seoul, São Paulo), 20 to 25 percent in much of continental Europe (e.g., London, Paris), and 35 percent or more in America’s largest automobile-oriented cities (e.g., Houston, Atlanta) (Vasconcellos, 2001). In India, the annual growth rate in traffic during the 1990s was around 5 percent in Mumbai, 7 percent in Chennai, and 10 percent in Delhi. However none of these cities have expanded their road supply by even one percent annually (Pucher et al., 2005).

In the developing world, buses are most vulnerable to the speed-eroding effects of traffic congestion. Because many are long, lumbering vehicles with slow acceleration and deceleration, restricted turning radii, and limited maneuverability to switch lanes, buses move the slowest in highly congested conditions. Average peak-period bus speeds in Bangkok are 11 km/hr, for example, compared to 20 km/hr in Curitiba, Brazil, one of the first cities to provide exclusive bus-lanes (Cervero, 2000). Stop-and-go traffic causes buses to over-heat and breakdown. Unreliable services in turn chase away choice consumers who have the option of driving a car instead.
5. Toward Sustainable Transport

It is increasingly recognized that sustainability in the urban transportation realm must be pursued and achieved on multiple fronts – environmentally, socially, and economically. This section addresses these challenges.

5.1 Environmental Sustainability

The urban transport sector’s ecological footprint is enormous and expanding. Many environmental problems in the urban transport sector are rooted in its reliance on petroleum, the automotive fuel source of choice, to propel motor vehicles, increasingly ones that are privately owned and used. The share of the world’s oil consumption accounted for by transportation rose from 45.2 percent in 1973 to 61.7 percent in 2009, and the sector is expected to continue to drive the growth in oil demand (IEA, 2011). World reserves of conventional oil exceed what has been used to date, but with rapid motorization and thus increasing demands for oil, many observe believe it is unlikely that this energy source will last beyond the mid-century mark. Rising GHG emissions and global temperatures as well as levels of photochemical smog and particulates in urban air basins further underscore the urgency of weaning the sector from its dependency on oil and more generally auto-mobility. A combination of technological advances, demand management, and externality-based pricing will be critical in charting an environmentally sustainable future in the urban transport sector. On the technological front, clean-fuel vehicles and information systems that enable innovations like dynamic ridesharing and carsharing, will have pivotal roles to play. Reducing the demand for indiscriminant auto-mobility, such as by designing compact, mixed-use cities that shorten trips and encourage NMT, will also be important. Setting price signals so that polluters and those driving in rush hours internalize costs are similarly part of the environmental sustainability equation.

Environmental sustainability will depend on good economics (e.g., congestion pricing) but also the presence of the other two pillars of sustainability – institutional capacities and social equality. Setting maximum air and noise pollution standards will be useless unless there is the political will and regulatory resources in place to enforce them. Nor will the premature introduction of costly low-carbon fuel alternatives aid the poor if bus fares increase as a consequence.

5.2 Social Sustainability

Urban transport is socially sustainable when mobility benefits are equally and fairly distributed, with few if any inequalities in access to transport infrastructure and services based on income, social, and physical differences (including gender, ethnicity, age, or disabilities). Social sustainability is rooted in the principle of accessibility wherein
equality exists among groups in accessing opportunities for employment, housing, retail markets, and other essential urban services. It recognizes mobility and accessibility as human rights, not privileges. Cities that ensure accessibility for all are socially inclusive and ones that do not are socially exclusive.

One important aspect of accessibility is the affordability of transport modes. By affordability is meant the financial capacity to pay for the ability to reach destinations for everyday needs, such as work, education, and shopping, without undue economic hardships. For many urban dwellers in developing countries, the availability of reliable and affordable bus and rail services can be the difference between being integrated into the economic and social life of a city or not. The share of marginalized city-dwellers with poor access to essential facilities and services, including public transport but also clean water and sanitation, is increasing worldwide. In the poor informal housing settlements on the outskirts of Mexico City, beyond the service jurisdiction of the city’s 201-km metro, residents sometimes must take 2 to 3 separate collectivos (shared-ride taxis and microbuses) to reach a metro terminal which provides low-cost connections to the core city and job opportunities (Cervero, 1998). Travel can consume 25 percent or more of daily wages. Time costs can also be exorbitant: 20 percent of workers in Mexico City spend more than 3 hours traveling to and from work each day. Studies show that taking a series of informal minibuses and motorized tricycles to and from work can cost 20 to 25 percent of daily wages in rapidly growing cities like Delhi, Buenos Aires, and Manila and as high as 30 percent in Nairobi, Pretoria and Dar Es Salaam (Vasconcellos, 2001; Kalthéier, 2002; Ferrarazzo and Arauz, 2000; Carruthers, et al., 2000).

5.3 Economic Sustainability

The urban transport sector is economically sustainable when resources are efficiently used and distributed to maximize the benefits and minimize the external costs of mobility, and investments in and maintenance of transport infrastructure and assets can be sustained. The translation of investments in walkways, bikeways, transitways, and roadways into jobs, business expansion, and increased economic output means that the urban transport sector is on an economically sustainable pathway. Increasingly, the litmus test of cost-effective transport infrastructure is whether the project is “bankable” – capable of attracting loans and private investors.

Urban transport infrastructure is expensive. It can consume a large share of the public largesse in emerging economies. In Ho Chi Minh City, a US$5 billion subway is currently under construction and in Jakarta a new ring road is expected to cost about the same amount. Crafting reliable and equitable funding programs for transport infrastructure that reward efficient and sustainable behavior remains a formidable challenge.
6. Sustainable Mobility and Urbanism

Coordinating and integrating urban transport and land development is imperative to creating sustainable urban futures. Successfully linking the two is a signature feature of “smart growth”.

This section probes the challenges of linking transport-infrastructure investments and urban development in what is an increasingly important mobility platform: Bus Rapid Transit (BRT). BRT systems have gained popularity worldwide because they are a cost-effective alternative to far more expensive urban rail investments. High-quality bus-based systems also better serve the low-density settlement patterns of many suburban markets and small-to-medium size cities due to the inherent flexibility advantages of rubber-tire systems – the same vehicle that provides speedy line-haul services on a dedicated bus lane or busway can morph into a feeder vehicle, collecting and distributing customers on local streets. To date, more than 150 cities have implemented some form of BRT system worldwide, carrying around estimated 28 million passengers each weekday (BRTDATA.ORG).

6.1 Bus Rapid Transit and Urban Development

New kilometers of BRT lines are today being added at a rapid-fire pace, gaining particular favor in the developing world, following on the heels of widely publicized BRT successes in Curitiba, Bogotá, Mexico City, Istanbul, Ahmedabad, and Guangzhou. These developing cities show that high-performance BRT systems that yield appreciable mobility and environmental benefits can be built at an affordable price. Metrorail systems, studies show, can cost 10 times as much a BRT system of similar length (Suzuki et al., 2013). Light Rail Transit (LRT) can be more than four times as expensive. Besides cost-savings, highly congested mega-cities of the world, like Jakarta, Delhi, Sao Paulo, and Lagos have been drawn to BRT because high-capacity transit can be built and expanded quickly during periods of rapid motorization and ever-worsening traffic congestion. The ability to open segments before an entire system is in place is particularly attractive to politicians and taxpayers who want quick results. Politicians are also drawn to the economic development potential of BRT. In its Liveanomics series, the Economist Intelligence Unit (2011) found that 61 percent of surveyed mayors reported that “improving public transport/roads” was the most important thing that could done to make their city more competitive for business on the global stage. This was nearly twice the share that felt investing in schooling and education was the key to being economically competitive.

BRT will no doubt play an increasingly prominent role in the global campaign to achieve more sustainable urban and mobility futures. This is partly because the bulk of future population growth will be in intermediate-size cities, the very places where BRT is often more cost-effective than its pricier alternative, metrorail transit (UN Habitat,
Future growth of not only population but also economic outputs is also projected for intermediate-size cities (Glaeser and Joshi-Ghani, 2012).

Figure 1 rank-orders countries or regions based on the number of cities with BRT systems as of mid-2013. The vast majority of these systems have been built in the last 15 years. Brazil has emerged as the global leader in building BRT systems, extending the success of Curitiba’s pioneering system to 30 other cities. Other Latin American countries, notably Colombia and Mexico but also Chile, Peru, and Ecuador, have since followed Brazil’s lead. Latin America is today the epicenter of the global BRT movement. A third of BRT route kilometers and nearly two thirds (63%) of ridership are in Latin America (BRTDATA.ORG, 2013). Among 38 Latin American BRT cities with reliable data from BRTDATA.ORG, average weekday ridership is more 10 times greater than averages for BRT cities of the U.S. and Europe. Latin American BRT systems are also considerably more productive than systems elsewhere. Figure 2 shows that they averaged more than 2 ½ times as many weekday riders per BRT kilometer as Asian

Figure 1. Number of Cities with BRT Systems, by National and Regional Settings, 2013.

Source: BRTDATA.ORG.
It is widely accepted that for public transit systems to be successful, they must be accompanied by high densities (Pushkarev and Zupan, 1977; Cervero, 1998; Newman and Kenworthy, 1999). Mass transit, as the saying goes, needs “mass”. For 105 BRT cities for which reliable data could be obtained, Figure 3 suggests a moderately positive relationship between BRT ridership and urban density. The presence of outliers weakens the simple correlation (.225) and as the scatterplot reveals, the number of riders per BRT kilometer tends to vary more as urban densities increase. Regardless, the positive association between urban densities and ridership productivity argues in favor of BRTOD – Bus Rapid Transit-Oriented Development.
The challenges of leveraging TOD with BRT investment is probed in the next three subsections. The struggles faced by two of the world’s most extensive and highly regarded BRT cities – Bogotá and Ahmedabad – are contrasted with what remains the world’s best-case example of BRT-land-use integration – Curitiba, Brazil.

6.2 The Challenges of Leveraging TOD in Bogotá

Bogotá, the capital of Colombia and home to 7.6 million inhabitants, has gained a reputation as one of the world’s most progressive cities, underscored by the 2000 opening of what has been called the gold standard of BRT, the 110-km TransMilenio system. Delegations of officials and dignitaries from around the world visit Bogotá to marvel at the system. Operating on a two-lane dedicated carriageway, TransMilenio carries upwards of 40,000 passengers per hour per direction, which matches the
passenger-throughputs of most metros. The system also boasts enhanced stations (accessible by networks of skyways), smart card-based fare collection, advanced control systems, distinctive images, and affordable fares. TransMilenio’s patronage is growing at a healthy pace of around 10 percent annually, from 800,000 daily riders when it opened in 2001 to around 1.7 million today, accounting for 74 percent of public transit trips in the city. Finance policy has played a role in TransMilenio’s success. In 2000, a 20 percent surcharge was tacked onto all gasoline sales in Bogotá, with half the revenues earmarked for TransMilenio infrastructure. As a cross-subsidy from the 19 percent of Bogotá’s population that owned cars to transit-dependents, the policy promoted social as well as environmental sustainability.

While Bogotá’s TransMilenio is a substantial, widely celebrated BRT investment, able to carry some 45,000 passengers per direction per hour, reshaping urban form and land-use patterns was not a primary objective in its design. Building the system quickly and enhancing affordable transport for the poor was. Placement of BRT lines in mostly economically stagnant zones that were largely built out has suppressed land development. So has the siting of BRT stations in busy roadway medians, which limits joint development opportunities and creates unattractive pedestrian environs around stations. Minimal pro-active station-area planning and a dearth of incentives for private property-owners to redevelop parcels have also tempered TOD activities.

Since TransMilenio’s 2000 opening, Bogotá’s population has grown by 21 percent. Building densities have increased throughout the city, but mostly in areas away from TransMilenio corridors. The initial TransMilenio lines were built quickly in response to worsening traffic congestion but also to build political momentum and curry political favor for future expansions. Aligning corridors in mostly economically stagnant zones that were largely built out has suppressed land development. So has the siting BRT in busy roadway medians, which limited land supplies for leveraging TOD and resulted in mostly unattractive pedestrian environment immediate to stations. Minimal pro-active station area planning or incentives for private property-owners to redevelop parcels also tempered TOD activities.

Cadastral data obtained from the city of Bogotá reveals the degree to which urban growth turned its back on TransMilenio. Between 2004 and 2010, the mean floor-area ratio (FAR) of residential and commercial development increased by 7 percent throughout the city of Bogotá versus 5 percent within 1000 meters of stations along the initial 42-kilometer system (Suzuki, Cervero, and Iuchi, 2013). In fact, more densification occurred along surface bus routes that feed into suburban TransMilenio stations than around BRT stops. Matched pair comparisons of changes in building footprints between 1998 and 2011 for 1-km radii around BRT stations and otherwise similar control areas further revealed weak effects on urban growth. For all but end-of-line stations, more new construction occurred beyond than within 1000 meters of stations. Figure 4 shows one paired comparison for an intermediate station on a Phase II
line toward the southwest of the city, near the low-income neighborhood of Kennedy. Far less new development occurred within 1000 meters of the BRT station than the control area off the line. For terminal stations, however, there tended to be relatively more new building activities than in control areas, as revealed by one of the matched-pair comparisons shown in Figure 5, for the Americas terminal station. Other researchers have similarly found more land-use densification near TransMilenio’s terminal stations than control areas (Bocharejo, Portilla, and Perez, 2013). This higher degree of station-area activities was largely due to the commercial opportunities at terminals, representing busy transfer points between feeder buses and trunkline BRT services.

Figure 4. Footprints of new developments in Station Area and Control Area for an Intermediate Station, 1998 to 2011.
Source: Suzuki, Cervero, and Iuchi, 2013.

Figure 5. Footprints of new developments in Station Area and Control Area for an End-of-the-Line Station, 1998 to 2011.
Source: Suzuki, Cervero, and Iuchi, 2013.
Findings from Bogotá square with earlier assessments of transit investments and urban development (Knight and Trygg, 1977; Cervero and Seskin, 1995; Cervero and Landis, 1997), namely that transit cannot overcome weak local real estate markets. Station siting also matters. Placing stops in the medians of active roadways inevitably means a poor-quality pedestrian-access environment and thus little commercial development near the stations themselves. TransMilenio’s design gave little weight to the pedestrian experience. The visually prominent skywalks that connect to BRT stops create lengthy, circuitous walks, can be noisy (resonating like steel drums during peak traffic conditions, by some accounts), and are difficult for the elderly, disabled, and semi-ambulatory individuals to negotiate. Bogotá’s experiences further show that planning matters. Neither the city nor neighborhood districts (where detailed land use planning is regulated and implemented) prepared station-area plans to orchestrate private development, change zoning (including increasing permissible densities), introduce complementary improvements (like streetscape enhancements) to entice private investments, or take any other pro-active steps to leverage new development.

The one area for which local leaders win kudos has been the bundling of transit investments and the provision of affordable social housing for the poor. In 1999, at the time Bogotá’s successful Transmilenio BRT system was being built, an innovative land-banking/poverty-alleviation program, called Metrovivienda, was launched (Cervero, 2005). Under Metrovivienda, transportation and housing are treated as bundled goods. The city acquires plots when they are in open agricultural uses at relatively cheap prices and proceeds to plat and title the land and provide public utilities, roads and open space. Property is sold to developers at higher prices to help cover infrastructure costs with the proviso that average prices be kept under US$8,500 per unit and are affordable to families with incomes of US$200 per month.

To date, four Metrovivienda sites have been created near one of Transmilenio’s terminuses, each between 100 and 120 hectares in size and housing some 8,000 families. At build out, the program aims to construct 440,000 new housing units. Putting housing near stations helps the city’s poor by “killing two birds with one stone” – i.e., providing improved housing and public transport services. Those moving from peripheral illegal settlements into transit-served Metrovivienda projects enjoy both “sites and serviced” housing and material improvements in access to major economic centers in the city. It is estimated that job-accessibility levels via transit within one-hour travel times increased by a factor of three for those moving from illegal housing to legal Metrovivienda projects (Cervero, 2005).

An important aspect of the program is the acquisition of land well in advance of BRT services. Because Metrovivienda officials serve on the Board of Transmilenio, they are aware of strategic plans and timelines for extending BRT. This has enabled the organization to acquire land before prices are inflated by the arrival of Transmilenio. Acquiring land in advance has enabled Metrovivienda to keep prices affordable for
households relocated from peripheral “clandestine” housing projects. Transmilenio also makes commuting more affordable. When living in the hillsides, most residents used two different public transit services (a feeder and a mainline), paying on average US$1.40 a day to leave and return home (Cervero, 2005). With Transmilenio, feeder buses are free, resulting in an average of US$0.80 in daily travel costs.

Metrovivienda serves as a model of multi-sectoral and accessibility-based planning in a developing country. By coupling affordable housing with affordable transport, Bogotá leaders have improved access to jobs, shops, and services while reducing the joint costs of what often consumes two-thirds of the poor’s income: housing and transport. Whether Metrovivienda makes a serious dent in the city’s housing shortages and traffic woes remains to be seen, however most observers agree that it is a significant and positive step forward.

6.3 The Challenges of Leverage TOD in Ahmedabad

In the 2009, Ahmedabad opened India’s first and what today remains the country’s largest BRT network. Called Janmarg (“People’s Way), the current 45 km system was built to relieve mounting traffic congestion in India’s fifth largest city. With some 5.5 million inhabitants, Ahmedabad is today one of the world’s fastest growing cities (Forbes, 2010). The ingredients are thus there for BRT to shape future urban growth: rapid growth and motorization coupled with worsening traffic congestion. To date, however, few notable changes have occurred near Janmarg stations.

As in Bogotá, Janmarg was envisaged and design as a mobility investment, not a city-shaping one. Janmarg lines were and are being selected to serve the city’s fastest growing areas, more so than in the case of Bogotá, however little attention has been given to the physical integration of BRT stops with surrounding neighborhoods or increasing the share of future populations and workers near BRT. Janmarg, slated to span some 220 kilometers at build-out, which would make it one of the most extensive BRT systems anywhere, was designed mainly to keep costs low. Little thought was given to urban development possibilities. So far, no land-use or TOD plans have been prepared for any Janmarg stations. What land development is occurring has been left solely to private market forces.

So far, Ahmedabad officials have opted to maintain uniform densities throughout the city, regardless of how close parcels might be to transit corridors. This has been done to disperse trips and thus decongest the city. It has also been done for socio-cultural reasons, namely to avoid creating a privileged class of land owners whose new-found wealth is create through government fiat. However keeping densities uniform also shifts growth to the periphery, in a more auto-oriented configuration. In the near term, the city may experience less traffic congestion due to density caps however over the long term,
the resulting auto-oriented urban form could backfire, creating more traffic congestion and air pollution for the region as a whole.

Several design shortcomings also need to be overcome if Ahmedabad is to spawn TOD. Janmarg was and is being designed as a closed system, requiring users to access stations sited in the medians of roadways by foot, bicycle, car, two-wheeler, three-wheelers, or surface-street buses. Little attention, however, has been given to perpendicular connectors to BRT stops. No secondary feeder systems provide safe and efficient pedestrian, bikeway, and transit connections to mainline services. While a substantial network of cycletracks was built in conjunction Janmarg, for the most part bike-paths run parallel rather than perpendicular to the busway, thus functioning more as competitive than complementary systems. Moreover, there is no bicycle parking at stations. What few pedestrian-ways exist near Janmarg stops are often occupied by motorcycles and fast-moving three-wheel vehicles.

6.4 BRT and Urbanism in Curitiba

A counterpoint to failures in coordinating BRT and urban development is the well-chronicled experiences of Curitiba, Brazil. Guided by a cogent long-term vision of the future city, the municipal government mandated that all medium- and large-scale urban development be sited along a BRT corridor. Orchestrating regional growth has been the Institute for Research and Urban Planning (IPPUC), an independent entity charged with ensuring integration of all elements of urban growth.

A design element used to enhance transit accessibility in Curitiba is the “trinary”—three parallel roadways with compatible land uses and building heights that taper with distance from the BRT corridor. The first two floors of the busway, which do not count against permissible plot ratios (building height/land area), are slated for retail uses. Above the second floor, buildings must be set back at least five meters from the property line, to allow sun to cast on the transitway. The inclusion of upper-level housing entitles property owners to density bonuses, which has led to vertical mixing of uses within buildings. An important benefit of mixed land uses and transit service levels along these corridors, in addition to extraordinarily high ridership rates, has been balanced bidirectional flows, ensuring efficient use of bus capacity. The higher densities produced by the trinary design have translated directly into higher ridership. Concentrated commercial development has also channeled trips from residences beyond BRT terminuses to the trinary corridors. In 2009, for example, 78.4 percent of trips boarding at the terminus of Curitiba’s north-south trinary corridor were destined to a bus stop on the same corridor (Duarte and Ultramari 2012). Today, Curitiba’s share of motorized trips by transit (45 percent) is the highest in Latin America (Santos, 2011). High transit use has appreciably shrunk the city’s environmental footprint. Curitiba’s annual congestion cost per capita of $0.67 (in US$2008) is a fraction of São Paulo’s (Suzuki et al., 2010). The city also boasts the cleanest air of any Brazilian city with more than 1
million inhabitants, despite having a sizable industrial sector. The strong, workable nexus that exists between Curitiba’s bus-based transit system and its mixed-use linear settlement pattern deserves most of the credit.

Sustained political commitment has been pivotal to Curitiba’s success. The harmonization of transit and land use took place over 40 years of political continuity, marked by a progression of forward-looking, like-minded mayors who built on the work of their predecessors. A well-articulated long-term vision and the presence of a politically insulated regional planning organization, the IPUCC, to implement the vision have been crucial in allowing the city to chart a sustainable urban pathway.

One area where Curitiba’s BRT investment has fallen short is the provision of housing for the poor. Most social housing built in the last 40 years for Curitiba’s poor has been far from main transit axes and transport corridors (Duarte and Ultramari, 2012). The availability of cheaper land and laxer environmental regulations on floodplain development prompted Curitiba’s authorities to put the most disadvantaged households in the least transit-accessible locations.

7. Close

The best ideas for advancing sustainable urbanism and mobility will go nowhere unless there is the political will and institutional capacity to embrace and move forward with them. The ability to manage and respond to escalating demands for urban travel is often limited in developing cities. Institutional shortcomings – such as an insufficiently trained and educated civil-service talent pool or absence of a transparent and corruption-free procurement process for providing transport infrastructure – abound. Limited experience with urban management, budgeting and accounting, urban planning, finance, and project supervision have thwarted Indonesia’s decentralization of infrastructure programs from the central to local governments over the past decade.

Sustainable mobility futures will depend upon a re-ordering of priorities, a paradigm shift if you will, that promotes inherently resourceful forms of mobility, frames investments in more holistic (and less mobility-focused) terms, and importantly seizes opportunities to integrate transport infrastructure and urban development when and where they avail themselves. As more and more growth shifts to cities of the Global South, opportunities for linking land development and transport infrastructure should not be squandered. Given that a large share of future urban growth is projected for small-to-medium size cities, bus-based forms of smaller scale transit-oriented development interlaced by high-quality infrastructure for pedestrians and cyclists holds promise in many global settings. Many developing cities have the kinds of pre-requisites needed if BRT investments are to trigger meaningful land-use changes, including rapid growth, rising real incomes, and increased motorization and congestion levels. This, of course, assumes there is supportive planning and zoning, public-sector leveraging and risk-
sharing, a commitment to travel demand management to remove many built-in incentives to car use, and the capacity to manage the land-use shifts that are put into motion by transportation infrastructure investments.

While integrated transport and land development can relieve congestion, clean the air, and conserve energy, its potential to reduce what remains the gravest problem facing the Global South – extreme and persistent poverty – is every bit if not more important. All that is done in the developing world must pass the litmus test of helping to alleviate poverty. Designing cities and transport systems to enhance accessibility and affordability is pro-poor. So are initiatives that strengthen non-motorized and public transport, keep fares affordable, and protect vulnerable populations from the hazards of motorized travel. Mass transit needs to be pro-poor across the board. In many developing countries, this means investing in busways over metros to keep fares affordable and targeting affordable housing to transit-served corridors. In Brazil, transit is kept affordable via national legislation, called Vale Transport, that requires employers to provide bus passes for commuting expenses that exceed 6 percent of workers’ earnings. In Cairo and Bogotá, tens of thousands of low-income households have been relocated to more transit-accessible sites.

Being pro-poor also means designing high-quality and safe walking and cycling environments. Mixed land-use patterns and walking/cycling friendly environments allow the very poor to allocate income for other urgent purposes and thus helps reduce poverty. In the very poorest cities, small interventions – e.g. siting basic services such as schools, health centres, markets, and water standpipes to reduce travel distances – can make a big difference in the amount of time and energy devoted to transport. The time freed up allows women to achieve gainful employment and children to attend schools.

What are cardinal features of integrated and sustainable transport and urbanism everywhere -- accessible urban activities and safe, attractive walking and cycling environs – are particularly vital to the welfare of the neediest members of the world’s poorest countries.

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Santiago Conference.


PLENARY SPEECH
INDONESIA RAILWAY REFORM 
AND ITS ROLES IN THE DOMESTIC CONNECTIVITY AND REGIONAL ECONOMY

Suyono DIKUN¹

Abstract

In the last several years, Indonesia’s planning atmosphere has been crowded out by a lot of fancy strategic plans and master plans both in transport sector strategic plans and in cross-cutting issues. Most of the sector plans were constructed as a result of changes in legal and regulatory frameworks. New economic initiatives introduced by the government provided a more colorful planning horizon.

Indonesia’s transport is now facing a huge challenge in the forms of infrastructure deficit and gap of its services. Excessive demand as resulted from economic advancement, population pressures, massive urbanization, and poverty are several key factors that had been pressuring transport sector for long. Transport sector in Indonesia is also characterized by an imbalance in the use of modes; road transport carries more than 85 percent of national share for passengers and 91 percent of freight. This imbalance had created an inefficient road transport in the forms of heavy congestion, bottlenecking, and shortage of capacity.

This paper discusses the railway reform that is now slowly moving ahead after the issuance of the Railway Law and its elucidation in government regulations and Minister Regulations. A master plan to project future Indonesia railway up to 2030 had also been officially issued to be used as the national reference. The railway reforms is believed to be supportive to the concept of domestic connectivity and the master plan of the economic corridors. It is believed that railway in Indonesia could play a significant role in the big efforts to narrow the regional economic disparity of the country.

This paper observes the development of the strategic planning over the last several years, tries to position railway sector development in the planning horizon, and come up with a simple idea on how to integrate the planning documents. While the planning documents are very necessary to be developed as the main guidance for sector development, the implementation and the policy delivery of the plans, however, are poor. Strategic plans cannot be converted into implementable and workable undertakings and project delivery is even worse. One argues that it is the

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capacity of the institutions and the quality of the people working in the institutions that cannot make it; that there are some deficiencies in the policy-regulations-delivery chain; that the capacity to deliver is simply lacking.

**Keywords:** RPJMN, railway reform, regional growth, track authority, economic corridors, domestic connectivity

1. **Introduction**

The Government of Indonesia is now preparing its third national five-year development planning (RPJMN III) for the period of 2015-2019. The third mid-term plan will be legally used by the new administration following the presidential election in October 2014. Along with the first and second mid-term plans of 2004-2009 and 2010-2014, RPJMN III constitutes three out of four mid-term plans of the long-term development planning (RPJPN) 2005-2025. The legal basis for making the RPJMN is the Law Number 25/2004 on the National Development Planning System and Law Number 17/2007 on the National Long-Term Development Planning. Article 14 of Law Number 25/2004 stipulates that Bappenas is the government agency to prepare the draft of RPJPN and its subsequent RPJMN.

It is strongly viewed by many that the third RPJMN is critical in the sense that government must be able to accelerate the development of transport infrastructure in the next five years to come and that RPJMN III therefore should not be perceived as merely an ordinary continuation of policies and programs of its predecessors, but should contain necessary policy changes and far-reaching strategies to achieve the targets of accelerated development of transport infrastructure and services. These strong views emerged as a result of deep concern over the looming supply and service gap in the country’s transport infrastructure services in all fronts: roads, railways, ports, airports, urban transport, and inland waterways. The transport deficit is huge and it occurs simply because there is not enough transport infrastructure and service capacity to keep up with the increasing demand for economic mobility. The transport system supply falls short far below the economic demand for those services. Bottlenecks and heavy congestion build up at many transport facilities and gridlocks accumulate rapidly in many big and medium cities. A critical international measure that highlights this gap is the relative position of Indonesia compared to its nearest neighbors using the international logistics index. Regional gap in transport occurs because there are a lot of regions in Indonesia—both western and eastern part of the country, remote and backward areas, and small

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2. Law Number 25/2004 was issued on 5 October 2004 regulates all development planning process in national and sub-national levels.  
3. Law Number 17/2007 on RPJPN was issued in February 2007, two years after the new government issued Presidential Regulation No.7/2005 on RPJMN I, reflecting the situation of the new government when administration and political agenda is not compatible to each other.  
4. The international comparison of logistics in Indonesia (ranked 75) highlights the deficiency in both infrastructure and efficient operations compared to other Asian countries (Singapore 2, China 27, Malaysia 29, Thailand 35, Philippines 44, and Vietnam 53). Indonesia is falling behind and needs to act now.
islands— which simply do not have adequate transport infrastructure and services to make it possible for people, goods and services flow efficiently from one place to another, to access the local markets, and to generate local economy. One of many factors leading to persistent regional economic disparity is the transport infrastructure gap\textsuperscript{5}. These deficit and gap have been occurring for so many years following the economic advancement, population growth, and urbanization in the country and yet there is not enough rapid and significant transport development to alleviate the problems.

The RPJPN had also decided 32 policies and strategic actions as the main development targets as the measurements for the achievement of the RPJPN’s goals covering all aspects of social economic settings of the country. Two policies and strategic actions are worth mentioning:

1) The establishment of national infrastructure network as the united force of all islands in the archipelago, and
2) The establishment of integrated, seamless and reliable transport infrastructure network nationwide.

Figure 1 illustrates the structure of RPJPN along with its policy principles in transport sector issues in each of its four RPJMNs. It is clear from the figure that in 2025 Indonesia is projected to have established an integrated, seamless and reliable transport infrastructure network and services throughout the country. It is also clear that the RPJMN I to III have surprisingly very strong determination and decisive policy statements on the issue of private sector participation in the transport sector development and provision. Also RPJMN I and II do explicitly state the need for economic and transport institutional reforms in order to trigger the initiatives from the society to participate in the economic activities. The RPJPN had also given a clear direction to RPJMN III to create efficient and productive public-private participation schemes in providing reliable and accessible transport infrastructure networks, able to support strong and competitive Indonesia economy, and highly compliance with national spatial planning. Development of rural and village transport system networks to support agriculture sector is also highlighted in RPJMN III. For RPJMN IV, the RPJPN stresses the establishment of transport infrastructure network and services which are reliable, efficient, and affordable in all regions of the country which sustainably support the creation of developed and prosperous Indonesia.

It is also felt that RPJMN III is critical in the sense that this is the seemingly only time period when national planning document such as RPJMN could play a catalytic role in bridging the wide transport gap and could function as a legitimate driver in narrowing the deficit with its progressive, innovative, and “out-of-the-box” policy frameworks and development programs. Based on past experiences and learn from

\textsuperscript{5} Transport gap had been observed as one of the main factors causing the persistent regional economic disparity in the country
what had really happened with the outcomes of past planning documents, it is logical
to postulate that linear and ordinary continuation of previous planning documents
would not be good enough to address the country’s problems of transport
deficiencies and shortcomings. Deep concerns amounted over the slowness of the
implementation of the planning that the government is perceived to be sluggish in
realizing the transport infrastructure projects which had already been in the planning
list for long. Deficit accumulated because transport supply cannot keep up with the
increasing demand and that the slowness of transport service delivery has taken the
toll of the high-cost economy resulted from heavy congestion, bottlenecking, and
gridlocks. There is a sort of “missing link” in the policy-planning-delivery chain in
which the capacity of the institutions governing the transport sector has not been able
to transform regulations into project and service deliveries quick enough as to
efficiently support the economic movements of the country.

<table>
<thead>
<tr>
<th>Long-Term Development Planning (RPJPN) 2005-2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>The establishment of national infrastructure network as the united force of all islands in the archipelago and the establishment of integrated, seamless and reliable transport infrastructure network nationwide.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mid Term Development Planning (RPJMN) III 2015-2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The availability, reliability, and accessibility of transport infrastructure resulted from efficient and productive public-private participation scheme</td>
</tr>
<tr>
<td>• Development of rural and village transport system networks to support agriculture sector</td>
</tr>
<tr>
<td>• Strong and competitive Indonesia economy supported by the transport infrastructure and services</td>
</tr>
<tr>
<td>• Highly compliance transport networks with national spatial planning</td>
</tr>
<tr>
<td>• Development of rural and village transport system networks to support agriculture sector.</td>
</tr>
</tbody>
</table>

Note: Tasks given by RPJPN to RPJMN III are more complex than tasks given to the previous RPJMN. RPJMN III carries the burdens of both executing the tasks that have not have been accomplished in the past and tasks of bridging the past and the future laid out by RPJMN IV.

**Figure 1: Contents of Transport Related Issues in the RPJPN and RPJMN III**

*Source: Law Number 17/2007 on RPJPN 2005-2025*

2. The Economic Outlook

Following the severe economic crisis in 1997-1998, Indonesia’s economy had been gradually recovering. Economy was growing steadily from 3.5% in 1999 to 6.4% in the first semester of 2008. Global financial crisis that erupted in the end of 2008 did not seem to matter much although economy slowed down to a 5.2% level in the fourth quarter of 2008. During 2008 as a whole, Indonesia’s economic growth reached 6.1%, ahead of neighboring countries in spite of the significant impact of the world economic slowdown on the domestic economy, most importantly, in the last three months of 2008, analyzed by distribution, government consumption, investment, and exports dominated Indonesia’s GDP in 2008. Figure 2 depicts the historical recovery process from 1999 to 2009 with a projection until 2014 in which a 7% growth is anticipated. Despite a slowing growth in the last two quarters of 2008,
investment growth for 2008 overall reached 12.6%, increased significantly from the previous year. This improvement was related to business response to high export commodity prices in the first half of 2008. Also supporting strong investment growth was business confidence in the economic outlook, reflected in improved business sentiment. The strong investment growth during the January-November 2008 period was dominated by Foreign Direct Investment (FDI), in contrast to sluggish performance in domestic investment. The largest share of FDI flowed into the transportation and telecommunications sector, while domestic investment was led by manufacturing. Although investment growth has improved in recent years, there were some obstacles that remain to hamper the future investment climate. Among the various hindrances cited by investors are inefficient bureaucratic procedures and inadequate infrastructure support.

Indonesia’s economy in 2011 grew strongly at 6.5%, improved over the previous year and reached the highest growth experienced within the last decade. On the demand side, the growth was primarily supported by an increase in consumption and investment performance, while on the supply side the primary contributor was supported by manufacturing and trade sectors performance. The growth was accompanied by an improvement in the quality of growth as reflected by increasing in investments contribution and continuing high exports contribution, declining unemployment and poverty, and rising economic growth contribution from outside of Java. The high economic growth in the midst of a weakening global economy was supported by both high growth in the domestic economy and also continued high growth of exports. The performance of the domestic economy, especially with regard to consumption, was supported by the large capacity of the domestic economy, which come from a rise in purchasing power, the growth of the middle and upper class, a high proportion of productive age population, and rising employment in the formal sector. These conditions encouraged domestic and foreign business optimism, thus enhanced investment. Meanwhile, Indonesia’s strong export performance was supported by its ability to take advantage of intra-regional trade, particularly with countries whose economies were reoriented to focus on their domestic economy.

Approaching 2010, the fundamental of economy looked stronger and resilience, with macroeconomic indicators were stable and promising. Investment climate is
improving significantly and was rated as *Investment Grade* by Fitch and Standard & Poor rating agencies. Government has also shown its decisiveness to accelerate and expand its economic development by some strategic plans at hand; the economic corridors, national logistics system, special economic zones, and a handful of sector master plans. All plans would in the end touch transport infrastructure development as a major means to accomplish the goals. Transport infrastructure—ports, roads, railways, and airports—are in the core of all economic plans, without which efficient economic movements are almost impossible to undertake.

Another recent economic advancement is reported by McKinsey Global Institute in its September 2012 report which did an astonishing projection in which Indonesia will be moving from the 16th largest economy in the world today to the 7th largest in 2030 with 135 million members of consuming class, 71% of the population in cities producing 86% of national GDP, and US$ 1.8 trillion market opportunity in consumer services, agriculture and fisheries, resources, and education⁶. According to the report, 90 million Indonesian could join the global consuming class by 2030, powered by the continued rise of urban economy⁷. By 2030 Indonesia could become the seventh-largest economy in the world after China, the US, India, Japan, Brazil, and Russia-overtaking German and the UK. But Indonesia is at a critical juncture. The archipelago economy is confronted by three major challenges in the period to 2030. First, if the economy is to meet the government’s target of 7% annual GDP growth, Indonesia needs to boost labor productivity growth by 60% from the current rate. Second, Indonesia needs to ensure that economic growth is as inclusive as possible to narrow inequality and the uneven distribution of growth across the archipelago. And third, Indonesia needs to ensure that it does not suffer from infrastructure and resource constraints as its expanding consuming class delivers a welcome injection of growth.

### 3. The New Economic Initiatives

With the issuance of Presidential Regulation (Perpres) Number 32/2011 on May 20, 2011, government launched the *Master Plan for the Acceleration and Expansion of Indonesia Economic Development 2011-2025* (MP3EI). The Master Plan lays out the strong intention to create six economic corridors in the six big islands of Indonesia: Sumatera, Jawa, Kalimantan, Sulawesi, Papua, and

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⁷ McKinsey Global Institute defines the consuming class as those individuals with net income of more than US$ 3,600 per annum in purchasing power parity, at 2005 exchange rates.
Nusa Tenggara (Figure 3). The Plan has the spirit of not doing business as usual, which could be interpreted that the Plan must be implemented in such a rapid fashion manner with no or little bureaucratic hurdles and without too much depending upon the government budget. The private sector investment is therefore imperative and would probably constitute more than half of the total investment in the corridors.

The main objective of MP3EI is to enable Indonesia to convert itself to a developed economy with national GDP of around USD 4-4.5 trillion by 2025 and becoming the ninth largest economy in the world. It is projected that around 82% of national GDP would be contributed by the economic activities and productions in the economic corridors. This in turn would create spillover effects into other regions outside the corridors. The development of economic corridors in Indonesia is based on the potential and advantages inherent in each region throughout Indonesia. As a country consisting of thousands of islands and located between two continents and two oceans, the Indonesian archipelago has a unique combination of economic potentials with specific major islands or regions having its own strategic future-role in achieving Indonesia’s 2025 vision.

Table 1 shows the development themes for the six corridors according to the specific economic characteristics of each island. These themes will in turn characterize the economic mainstreaming of the corridors in which clusters of economic activities - industry, mining, plantations, and agriculture - will be linked up together along the corridor and will create the acceleration of regional and local economic growth in the region.

![Table 1: Themes for the Six Economic Corridors](image)

Table 2 shows the projected economic growth of the regions under three circumstances: (i) business as usual or do-nothing; (2) implemented RPJM programs; and (3) implemented MP3EI programs. Overall, Indonesia is projected to grow by 10.3% under do-nothing scenario and 12.4% under implemented RPJM programs in 2025. But implementation of MP3EI would enhance the economic growth into 12.7%. The six regions with the economic corridors would also be experiencing a growth of 11.8 to 13.8% in 2025 with the non-economic corridor regions would be having around 12.1% growth. While at one side the projections represent the optimism of the government heading towards a developed economy
circumstances of the country, on the other side, however, this has brought a big concern on how infrastructure along and within the corridors would be developed, financed, and managed accordingly to better serve the economic movements in the corridors. The economic growth would simply not exist without efficient and reliable transport system networks in the corridors.

### Table 2: Projections of 2025 GRDP in the Corridors Under Three Different Scenarios

<table>
<thead>
<tr>
<th>Corridors</th>
<th>Do Nothing</th>
<th>RPJM Programs</th>
<th>MP3EI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sumatera</td>
<td>10.2</td>
<td>12.5</td>
<td>13.2</td>
</tr>
<tr>
<td>Jawa</td>
<td>10.6</td>
<td>12.8</td>
<td>12.8</td>
</tr>
<tr>
<td>Kalimantan</td>
<td>9.1</td>
<td>11.2</td>
<td>11.9</td>
</tr>
<tr>
<td>Sulawesi</td>
<td>9.6</td>
<td>13.1</td>
<td>13.8</td>
</tr>
<tr>
<td>Bali-NTT</td>
<td>10.3</td>
<td>11.1</td>
<td>11.8</td>
</tr>
<tr>
<td>Papua-Maluku</td>
<td>8.8</td>
<td>12.2</td>
<td>12.9</td>
</tr>
<tr>
<td>Non ECs</td>
<td>10.5</td>
<td>11.8</td>
<td>12.1</td>
</tr>
<tr>
<td>Indonesia</td>
<td>10.3</td>
<td>12.4</td>
<td>12.7</td>
</tr>
</tbody>
</table>

Source: The MP3EI, 2011

Would the economic corridor concept and development programs be able to help alleviate regional economic disparity in Indonesia? It probably would provided that transport infrastructure is massively and radically built to the extent that economic movements along the corridors and from non-corridor regions could be served much more efficiently. In this matter, access roads and access rails from the production sites to the ports and airports are extremely critical for industrial complexes and other special economic zones to move their exports products smoothly.

4. **The Indonesia Railway Reforms**

Indonesia railway had been perceived as public sector obligation and had traditionally been heavily dependent upon government financing. Government is the owner, the financier, the developer, and the provider of railway services and business lines, horizontally, vertically, and spatially. The operational side of the monopoly was delegated to the state-owned enterprises, PT Kereta Api Indonesia (KAI). But after so many decades in operation, public monopoly has proved unsuccessful to bring railway as the most important transport mode in Indonesia and to provide an efficient and reliable passenger transport for the country. Rail transport is a mode which is efficient in energy use, consumes much less space, environmentally friendly, fast, and congestion-free. As such, rail transport has all the potentials to sustainably support the economic growth and dispersion. Rail transport, therefore, must be perceived as the backbone of transport system, i.e. the core of transport multimodal, distribution and logistic system. Under public monopoly, however, railway had no interactions, whatsoever, with the economy. The small share of passenger transport and the negligible share of cargo movement toward national economic movements had confirmed that railway had been long neglected as an economic entity.

Transport sector began its transformation with the issuance of new railway law, Law Number 23/2007. This was followed by the issuance of new laws in sea transport (No.17/2008), air transport (No. 1/2009), and land transport (No.22/2009). The laws
basically dissolve public monopoly and open the transport industry and services to private involvement. While the changes of legal frameworks are all astonishing, the change of railway law appears to be more pronounced. In the future, PT KAI, the holder of public monopoly and the incumbent operator, will no longer be the only railway operator as the new law has paved the way for the presence of multi operators. Following the issuance of the new railway law, government has taken three major steps in terms of policy measures. First is the making of two government regulations as the elucidation of the new law; second is the establishment of a national coordination team to revitalize the railway transport; and third is finalizing the railway master plan for 2025-2030.

Railway Master Plan is mandated by Article 7 of the Law Number 23/2007 and issued under the Minister of Transport Regulation. The Master Plan is ambitiously projecting rapid increases of rail share in the passenger and freight movements as shown in Table 3 below. During the next 15 years, rail share in passenger movement is projected to rise rapidly from about 6% to 11-13%, while the share in freight movement is projected to increase rapidly from the negligible 0.67% to 15-17%. The projections bring with them the consequences of the size of investment needed both in rail infrastructure and rolling stocks. Table 4 shows the rail development during 2010-2025 projected by the Master Plan as a consequence of the increasing rail share. The development of rail infrastructure and rolling stocks and its related control system until 2025 are imperative to anticipate the increasing modal share to 11-13% for passengers and 15-17% for freight. Railways in Indonesia therefore must have an economic interaction with the sector economy and regional development. Jawa Railway has the largest share for both passengers and cargo movements. The development of railways in Sumatera, Kalimantan, and Sulawesi would to some extent support the very basic idea of the economic corridors in the islands.

### Table 3: Projections of Railway Share in the Economy (% of National Movements)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Jawa Bali</td>
<td>8.49</td>
<td>4.22</td>
<td>9.66</td>
<td>7.82</td>
<td>10.83</td>
<td>11.41</td>
<td>12.00</td>
<td>15.00</td>
</tr>
<tr>
<td>Sumatera</td>
<td>5.24</td>
<td>6.50</td>
<td>7.16</td>
<td>11.00</td>
<td>9.08</td>
<td>11.00</td>
<td>11.00</td>
<td>20.00</td>
</tr>
<tr>
<td>Kalimantan</td>
<td>-</td>
<td>5.00</td>
<td>12.50</td>
<td>7.50</td>
<td>25.00</td>
<td>10.00</td>
<td>50.00</td>
<td></td>
</tr>
<tr>
<td>Sulawesi</td>
<td>-</td>
<td>5.00</td>
<td>3.75</td>
<td>7.50</td>
<td>7.50</td>
<td>10.00</td>
<td>15.00</td>
<td></td>
</tr>
</tbody>
</table>

Note: National average share of passengers: 11%-13% and for freight: 15%-17%

### Table 4: Projections of Railway Infrastructure Development

<table>
<thead>
<tr>
<th>Regions</th>
<th>Existing Track Length (km)</th>
<th>2025 Plan (km)</th>
<th>Future Development (km) 2010-2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jawa Bali</td>
<td>3,327</td>
<td>6,800</td>
<td>3,473</td>
</tr>
<tr>
<td>Sumatera</td>
<td>1,348</td>
<td>2,500</td>
<td>1,152</td>
</tr>
<tr>
<td>Kalimantan</td>
<td>-</td>
<td>1,100</td>
<td>1,100</td>
</tr>
<tr>
<td>Sulawesi</td>
<td>-</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Total</td>
<td>4,675</td>
<td>10,600</td>
<td>5,925</td>
</tr>
</tbody>
</table>

Source: The National Railway Master Plan, 2011. Note: National average share of passengers: 11%-13% and for freight: 15%-17%
5. **The Integration of Planning**

The biggest problem of Indonesia economic development seems to begin now. It actually starts from the planning which comes into being from fragmented, sector-driven, and triggered by closed-minded ego without any interfacing whatsoever between one planning to another. Railway master plan has no deliberation on ports and, vice versa, port master plan does not take into account the railway’s role in the freight movements. Road and rail planning does not take into account each other strategic role. Integration between transport and other economic sectors is also lacking; transport planning documents had been rarely interfaced with, for example, industry, tourism, and agriculture sectors. Given all those fragmented planning documents widely open on the table, the question becomes: How are they going to be integrated and reconciled? What would be the solid, single big picture synchronizing the policy, programs, and projects proposed by each planning document? Who would be doing the integration, eliminating unnecessary overlapping, and filling the gap? Who would be sitting in the driver seat and becomes the champion of this integration undertaking? And what the current government could do to speed up the integration given the one-year remaining time in the office?

But perhaps a simple step will do. For the railway sector, for example, use the Railway Master Plan as the baseline programs and projects to be integrated, adopt its strategic policy frameworks, institutional setting, and strategic projects in great need for implementation. Test the frameworks against the transport programs outlined in the new economic initiatives such as the MP3EI’s economic corridors, the Special Economic Zones, and other sector planning documents, and superimpose one over another; and let’s draw a conclusion on what programs and projects might be considered as the common interests. The follow-up actions would be to incorporate the consolidated programs and projects into the RPJMN III along with the indicative budget and the financing schemes.

6. **Conclusion: Making the Planning Works for Indonesia 2025**

The huge deficit and gap of transport infrastructure and services in nationwide scale had indicated the need for RPJMN 2015-2019 to be designed to carry much heavier burdens of transport development programs and project delivery for the next five years to come. The RPJMN III therefore should not be formulated as an ordinary continuation of its two predecessors. RPJMN I was the first planning document produced by the then new administration and as such no major intervention had been done to the full technocratic works assembled by Bappenas from different views of sector perspectives. No major changes had been made by the economic team of the new President to the final draft of the planning document prepared by Bappenas. It was the same President and the same political party ruling the country for 2010-2014 time periods, so there was no surprise at all if there was no irregularities emerged in the making of RPJMN II. This second mid-term planning document was likely constructed as a linear continuation of its predecessor in spite of new policy
principles mandated by the RPJPN and by the new transport laws. Although RPJMN has some degree of political determination that reflects the political economy of national development, technocratic determination was so overwhelming in the making of RPJMN I and RPJMN II that non-linearity of planning seemed impossible to be undertaken.\(^8\)

RPJMN I and RPJMN II were tasked by the RPJPN to promote and incorporate private sector participation intensively in the acceleration of transport development and that policy and regulations must be reformed and restructured. The development of transport infrastructure network was also intended to support economic institution that triggers the initiatives of the society in the economic activities. But the two planning documents did not explicitly elaborate these into their policy frameworks and strategic actions. The two documents were still heavily designed with state budget as the only source of development financing.\(^9\) The facts that private sector participation in the transport sector development and provision has not made any significant progress in the fourth year of RPJMN II have made it almost impossible for RPJMN III to take a linear course of its planning and strategic actions when it comes to Public Private Partnership (PPP) in transport, particularly in railway sector.

Having discussed that, it is logical to postulate that RPJMN III should not take a linear course in its policy determination and strategic actions plans. In term of PPP, RPJMN III can no longer refer the past data, draw a linear extrapolation, and end up with the future of the past. It is hypothetically perceived that RPJMN III has to take the course of non-linear plan to reach the “future of the future”\(^10\). This is the situation where projections of the next five year should not be based solely on the past data and the unachievable of the past. Projection is non-linear in the sense that political determination may predominantly prevail in order for massive and large railway transport infrastructure, for example, to be completely built and able to efficiently and effectively serve the economy of the country.

Figure 4 graphically illustrates a hypothetical “academic thought” of planning trajectory, constructed over the concerns of the current condition of railway sector in Indonesia and also taking into consideration all the global, regional, and national spectrums of economic mobility. The path to be taken is non-linear and tends to be exponential. As discussed above, RPJMN III will take the position of significantly above the RPJMN II in terms of technocratic and political determinations. This will

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\(^8\) Basically there are two main components in the making of a planning document. Technocratic determination focuses on the technocratic works-economic and financial aspects involving past data-and political determination takes into consideration politic of development into planning without too much regards on the viability of its programs.  

\(^9\) The big irony is that the economic and political elites of this country spend almost a year in any single fiscal year to discuss, debate, and deliberate the draft of annual state budget and pay very little or no attention at all to private financing aspects.  

\(^10\) The future of future simply means projecting with intervention and represents the stage of development that we envision to take place at the end of the plan. It is non-linear and reconfigures the balancing of technocratic and political determination. It can probably be considered as the predictions with intervention.
comply with the increasing global competition and compliance and complexity of social economic and political settings of the country. In this academic scenario, RPJM IV is considered as a conjecture\(^{11}\). The RPJPN’s development targets in the end of 2025 will not be hypothetically accomplished by any ordinary means. What the conjecture aims by means of transport accomplishment in the end of RPJMN IV is a high profile political intervention by which normal predictions are interfered socially and politically in order for RPJMN IV to accomplish the transport and railway development targets of RPJPN in the end of 2025.

Thus, begin with our vision of what would Indonesia’s railway be in 2025 and plan backward to the present. Under this backward path, the position of RPJM III becomes clear; that those planning documents must serve as intermediate development instruments to carry over the unachievable of the past, to carry the development tasks of RPJPN, and to smoothly transfer all achievements into the future. Prognosis is indispensable to good planning of any kind. In order to make transport planning works well for the future and planning documents are legitimate,

\(^{11}\) Conjecture is defined by New World Dictionary as an inferring, theorizing, or predicting from incomplete or uncertain evidence. A conjecture is a hypothesis that appears to be true but has not yet been proved to be true. Another source defines conjecture as a concluding statement reached by using inductive reasoning and it may or may not be true. Conjecture is frequently used in mathematical and computer algorithms modelling. But in term of RPJMN III, the spirit of conjecture is borrowed for the large enhancement of planning in order to achieve a set of development goals that might not otherwise be accomplished with normal planning procedure.
government must take into account future global economic setting, future technology, and future global environment. Predictions or conjectures about future socio-economic and technology are inherent in high-level planning such as RPJMN. After all, transport is about economy, technology, and environment. Figure 4 illustrates this academic vision in which RPJMN III and its corresponding RENSTRA would start planning the future of the future and no longer the future of the past.

References

Ministry of Transport. The National Railway Master Plan, 2011
PPP FOR INFRASTRUCTURE IN ASEAN MEMBER STATES: HOW DO DEVELOPING COUNTRIES UTILIZE AND GET BENEFIT FROM THE SCHEME?

Fauziah Zen, Economic Research Institute for ASEAN and East Asia (ERIA), fauziah.zen@eria.org

Abstract

Infrastructure has been worldwide perceived as key of development; such concept is not an exception for ASEAN member states. While infrastructure typically falls into non-commercially viable project, thus requires sovereign financing- the governments usually face lack of fiscal capacity to finance infrastructure. In recent years, Public-Private Partnership (PPP) has been increasingly gained popularity as alternative to financing modality in infrastructure development. In fact, there is overwhelming expectation on PPP to solve infrastructure problems. Misperception of PPP often becomes backlash to the utilization of PPP; its overestimated expectation brings unexpected responses that potentially ruin the project. Apart from that, differences in economic stage across ASEAN member states should not be ignored, and consequently the situation should be reflected in pertinent advices and actions on handling PPP. The paper reviewed the current situation of PPP in broad terms, or more precisely is “Private Sector Participation” (PSP) in ASEAN countries and provided the economies’ key characteristics. It also discussed the challenges to use the scheme to develop infrastructure especially in the least developed countries. Finally the paper suggested how ASEAN leaders should perceive PPP as one of financing modalities and what the way forward and direction in ASEAN development.

Keywords: PPP, financing infrastructure, ASEAN Connectivity

1. Introduction

ASEAN Member States (AMS) have committed to realize ASEAN Community by 2015 which can be structured into ASEAN Political-Security Community, ASEAN Economic Community, and ASEAN Socio-Cultural Community. The ASEAN has developed a Master Plan on ASEAN Connectivity (MPAC) “as a key step towards realising the ASEAN Community of continued economic growth, reduced development gap and improved connectivity among Member States and between Member States and the rest of the world by enhancing regional and national physical, institutional and people-to-people linkages”. The MPAC consists of three pillars of connectivity: institutional, physical, and people-to-people that interact one another as we can see in Figure 1.
To support a well-connected ASEAN, physical connectivity requires sufficient domestic infrastructure within member states to integrate with the whole region. Thus having sufficient infrastructure is vital. Infrastructure serves at least three functions, namely: (i) to provide basic human needs, (ii) to support people and goods mobility, and (iii) to support productivity.

Unfortunately, the quantity and quality of infrastructure in AMS in general is far below that in advanced economies (see Table 1). The most lacking ones are transportation, electrification, and access to clean water. World Economic Forum in its Global Competitiveness Report 2012-2013 indicated that in average, the quality of ASEAN infrastructure is only half of that in Japan and US.

<table>
<thead>
<tr>
<th>Region</th>
<th>Roads (km) per 1,000 people</th>
<th>Rail (km)</th>
<th>Phones (number)</th>
<th>Electrification Percentage</th>
<th>Clean Water Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASEAN</td>
<td>10.51</td>
<td>0.27</td>
<td>3.53</td>
<td>71.69</td>
<td>86.39</td>
</tr>
<tr>
<td>Asia</td>
<td>12.83</td>
<td>0.53</td>
<td>3.47</td>
<td>77.72</td>
<td>87.72</td>
</tr>
<tr>
<td>OECD</td>
<td>211.68</td>
<td>5.21</td>
<td>13.87</td>
<td>99.80</td>
<td>99.63</td>
</tr>
<tr>
<td>Latin America</td>
<td>14.32</td>
<td>2.48</td>
<td>6.11</td>
<td>92.70</td>
<td>91.37</td>
</tr>
<tr>
<td>Africa</td>
<td>n.a.</td>
<td>0.95</td>
<td>1.42</td>
<td>28.50</td>
<td>58.36</td>
</tr>
</tbody>
</table>
Note: km=kilometer, OECD = Organization for Economic Co-operation and Development.
Source: ADB, UNDP and UNESCAP, 2010

Some assessments on the infrastructure demand come up with estimates ranging from $6 to $8 trillion for a decade period of estimation. Asian Development Bank (ADB) projected that ASEAN economies need to invest over $60 billion a year in infrastructure until 2020 to support and maintain the region’s high economic growth. It requires spending level at about 7 to 8 percent of GDP, double from current level at 3 to 4 percent of GDP. The shortage funds call for bigger role of private sector, hence PPP has becoming hot issue recently.

![Figure 2 Investment needs for Asia's identified and pipeline infrastructure projects, 2010-2020, $ trillion](source)

Source: ADB, Clean Edge, WB PFI Database (modified from McKinsey Analysis)

2. Private sector participation in ASEAN Member States

ASEAN member states have different stages of infrastructure policy, financing method, and financial capacity. Singapore and Brunei have abundant domestic financial resources to build their infrastructure. In these countries PPP is adopted mainly for the reason of improving public sector efficiency (in Singapore) and utilizing private sector competence (in Brunei). Malaysia, Indonesia, Thailand, and Philippines have been adopting PPP quite progressively to fill financing gap and tap private sector’s competence.

In Cambodia and Vietnam, private sector participation becomes increasingly important in infrastructure development. However, there are limited numbers of PPP projects in these countries, mainly supported by international organizations such as ADB and the World Bank.

Meanwhile, Laos and Myanmar are still facing multiple challenges, especially in the following issues: lacking fiscal resources, low capacity, lacking regulatory framework, and challenging macroeconomic situation. To maximize the utilization, PPP requires mature private sector and sufficient access to capital market; the condition that is unfortunately uncommon in half of AMS as shown in Table 2.

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Brunei</td>
<td>✓</td>
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<td>➔</td>
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<tr>
<td>Indonesia</td>
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<tr>
<td>Malaysia</td>
<td>➔</td>
<td>✓</td>
<td>➔</td>
<td>✓</td>
</tr>
<tr>
<td>Thailand</td>
<td>➔</td>
<td>➔</td>
<td>➔</td>
<td>✓</td>
</tr>
<tr>
<td>Philippines</td>
<td>➔</td>
<td>➔</td>
<td>➔</td>
<td>✓</td>
</tr>
<tr>
<td>Vietnam</td>
<td>➔</td>
<td>➔</td>
<td>➔</td>
<td>➔</td>
</tr>
<tr>
<td>Cambodia</td>
<td>➔</td>
<td>➔</td>
<td>➔</td>
<td>➔</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>➔</td>
<td>➔</td>
<td>➔</td>
<td>➔</td>
</tr>
<tr>
<td>Myanmar</td>
<td>➔</td>
<td>➔</td>
<td>➔</td>
<td>➔</td>
</tr>
</tbody>
</table>

Notes:
✓ = in good state
➔ = in good direction
➔ = need more attention/stagnant

*Fiscal situation: use S&P, Moody’s and Fitch credit ratings as proxy
Source: Zen and Regan (ERIA, 2013)

3. PPP as financing modality

Apart from its advantages to bring private sector’s competence into a better public service delivery, PPP can be viewed –and this is the most popular view- as one of purchasing methods to deliver public services. An internationally standardized PPP requires a quite complex system to ensure the objectives of PPP can be achieved. Hence PPP is not a method suitable for all types of projects.

Recalling the various ways to finance infrastructure, as shown in figure 3, PPP is a procurement method to expand private sector’s involvement in developing non-commercially viable projects. The most possible ones are the projects that fall into
economically viable category. As for nonviable projects, when they are schemed into PPP, public sources have to finance most of the costs, or the government should increase the creditworthiness of the projects to transform the projects into financially viable ones.

PPP should not be viewed as additional free money to build infrastructure. It actually restructures the financing configuration through contract arrangement between public and private entities. Private entities finance some of (or full) total costs of construction but expect profits in return. Thus someone has to pay, either through tax and subsidy or through user charges. This principle unfortunately has not been well understood by some governments, leading to the attempt to shift all risks and most financial burden to private entities. The “languages” spoken differently by government versus private entities lead to prolonged or even failed project negotiation.

![Figure 3 Financing Infrastructure](source: ERIA (2012))

The problem is rooted in lacking understanding of how financing and funding should work in PPP. Many decision makers are confused with these two terms, leading to unsustainable project. Financing refers to the construction or initial project costs. That can be come from public sector directly (all from government budget) or indirectly (usually combination of budget and private sector debt and equity). Meanwhile, funding is the main source of payment to sustain the project. The sources usually come either from government, means taxpayers’ money, or user charges. Thus a project should be carried from its construction till the operation during its life-cycle. PPP horizon should cover at least one period of project life-cycle.
In the economies where both public and private sectors have sufficient capabilities to run a PPP project, the numbers of procurements made through traditional way still outnumber PPP projects. Typical PPP project requires higher efforts – budget-wise and time-wise, hence a small size project usually is not recommended for PPP\(^3\). Another reason is the flexibility needed to structure the funds through syndicated debt over a number of financial institutions and structured in several tranches denominated in different currencies, interest rates, maturities and security ranking (Zen and Regan, 2013). Small size projects usually have less room for those options.

The case for medium size projects, say minimum at USD25 million, implemented in PPP scheme has evidence as well. Philippines PPP Centre runs some small size projects especially in social infrastructure including schools and hospitals, some of them are brownfield projects. Small size projects can still get benefits from PPP especially in securing deliverables, standardized and stable output, as well as efficient management. What we need to consider is the trade-off between costly process and desirable outputs. This calls for a simpler PPP or “lite PPP”. Since lite PPP does not consist of complex financing or management structures, or complex design and construction, it is suitable for the projects with state availability payment and do not involve currency mismatch risk (Zen and Regan, 2013).

Despite its costly and long process, PPP has several advantages compared to traditional procurement. Australian experience showed that in total PPP projects have lower cost overruns than traditional projects. Further, albeit initial cost estimated for PPPs is far higher than that of traditional procurements, its final actual cost turned out to be lower (see table 3).

<table>
<thead>
<tr>
<th></th>
<th>Initial Cost Estimates</th>
<th>Contractual Commitments</th>
<th>Cost Overruns</th>
<th>Final Actual Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional Projects</td>
<td>3082.0</td>
<td>4532.6</td>
<td>672.5</td>
<td>5205.1</td>
</tr>
<tr>
<td>PPPs</td>
<td>4484.4</td>
<td>4946.1</td>
<td>57.6</td>
<td>5003.7</td>
</tr>
</tbody>
</table>

*Source: Infrastructure Partnership Australia, 2007.*

The projects that are free from difficult risks (e.g. currency mismatch, demand risks) have a big chance to be successfully offered as PPP. Independent Power Producer (IPP) is a typical basic PPP project, because the off taker is well defined and credible thus the consortium does not bear demand risk. Negotiation on water projects is often more complicated since they usually belong to subnational governments and could involve more than one jurisdiction. Difficulties are higher for the nonviable projects such as non-toll roads. When no fee can be charged, the government should find a way to make the project feasible for PPP.

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\(^3\) Some institutions suggest that only projects with size at least USD100 million will be efficient for PPP.
There are some ways to increase the creditworthiness of the projects. One option is government acts as the off-taker. In case of non-toll road, government can set in the contract that it will pay a certain fee for every vehicle passing the road. However, when it is possible to impose a user charge—even though underpriced, this is considered better option than full subsidy. However, some rural roads may not be feasible to become toll road, but they are important to support economic growth. This is similar with the case of PPP in social infrastructure such as schools.

Another way to make the project attractive is to enlarge the scope of initial project. A non-toll road—or road with underpriced charge, can be wrapped with commercial license in some parts of it, for example to include commercial properties (resort, hotel, amusement park, tourism complex, etc.). The package will improve financial cash flows of the whole project and allow cross-subsidy from one business unit to another one within the project. Huge project can also be unbundled to provide some flexibilities and modifications in certain blocks of the project.

In above cases, the benefits from adopting PPP scheme compared with traditional procurement are: i) securing reliable public services, ii) reducing overall cost because of using life-cycle horizon rather than short term period, iii) shifting fiscal burden from upfront and large funds to periodically disbursed installments, iv) having infrastructure faster thus gaining present socio-economic benefits, and v) improving public sector efficiency by deterring government from non-core tasks.

4. Challenges

Despite the lessons from success and failure stories of PPP projects around the world are abundant for public access, misperception of PPP is still common. Many people nevertheless think of PPP as panacea for infrastructure problems. Many also perceive that PPP will lift the government burden in infrastructure provision. In parallel, many still confuse PPP and traditional procurements. However, increasing interests on adopting PPP should be viewed positively and used as means to bring more PPP into good practices.

The basic problems for most developing economies to adopt PPP are (i) insufficient regulatory framework, (ii) lacking capacity, and (iii) lacking fiscal resources. Regulatory framework can be approached differently from country to country, but the ultimate goal is similar: to increase private sector’s confidence to involve in PPP projects. Some countries may need specific PPP regulation while some others may not need it. The capacity problems are not monopolized by public sector; in new emerging countries such as Cambodia, Lao PDR, Myanmar and Vietnam, (and Brunei) private sector development is still at early stage and need to be nurtured properly. The situation is usually coupled with the issues of lacking access to capital market and limited fiscal space in government budget. PPP still requires fiscal contribution from government budget, directly or indirectly, current or later. Currently, Lao PDR, Myanmar and Vietnam are facing the problems of
macroeconomic instability as well as limited fiscal space, induce to decreasing options of loans from international institutions or bilateral resources.

In fact, lacking funds to finance infrastructure is not the main problem per se. There are massive supplies of surplus capital—global savings currently amount to US $17 trillion— with investors looking for long-term stable returns: this is the 'infrastructure paradox'. A similar paradox exists in ASEAN countries, too, where both savings rates and foreign reserves are high (Shishido, Sugiyama, and Zen, 2013). Interviews with long-term funds management have confirmed that supply does exist but it cannot be fully utilized for infrastructure investment because of lacking appropriate channels⁴. Additionally, the supply can grow more than existing amount if the options for investing in long-term portfolios are expanding as well.

The reasons of why only few numbers of PPP projects in AMS are mainly caused by two conditions, namely: lacking investor friendly environment and lacking properly prepared projects. Many countries cannot provide supportive business environment such as granting sufficient regulatory framework, legal certainty, and appropriate incentives. Meanwhile, to be able to offer attractive projects, government should make serious efforts in project preparation, hence requiring competent human resources, sufficient allocated fund for Project Development Facility (PDF), and proper communication with international community.

At regional level, there are a number of efforts provided by international organizations to support PPP implementation. The supports come in various ways: capacity building, technical assistance, co-financing, facilitating negotiation, promotion, etc. However, within ASEAN scope, there is no centralized and integrated coordination for PPP support.

Again, all benefits from PPP can only be obtained if the project is well structured and well planned. The government’s credibility is vital; private sector holds the view that the manageable certainty is vital to determine its involvement.

5. Way forward

Current situation of implementing PPP has provided us with several challenges to be addressed. The solution definitely is not a one-time action but should be continuous and systemized efforts. Capacity building is a long-term process and could potentially fall into inefficient endeavor if not well designed and coordinated.

Building a solid regulatory framework requires several years and strong commitment from various stakeholders, thus it is a long-term action. While the reform should be done when needed, the ad hoc approach may be used as pragmatic and short-term

⁴ Sources: Mr. Donald Kanak (Prudential Asia Corp.): Sep 20th, 2013 and Dr. Leonnie Lethbridge (ANZ Indonesia): July 24th, 2013. pers. comm.
solution. The approach of “sterilized regulation” to secure the contract can be used as long as it is complied with standardized legal framework.

Regional cooperation should be enhanced to transform existing efforts into synergy and to realize ASEAN Connectivity. Some recommended actions would include: providing suitable PPP Guidelines for ASEAN Member States, establishing PPP Forum, and continuous systemized capacity building program as well as suitable technical assistance.

Reference:


## Annex

### Summary of PPP Implementation in ASEAN Member States

<table>
<thead>
<tr>
<th>Country</th>
<th>Public Body Responsible for Implementation</th>
<th>Type of Private Sector Participation</th>
<th>Projects/Sector</th>
<th>Background/Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brunei</td>
<td>Department of Economic Planning and Development</td>
<td>Not yet determined</td>
<td>Housing</td>
<td>Just started in 2010. No specific regulation for PPP.</td>
</tr>
<tr>
<td>Cambodia</td>
<td>Not determined</td>
<td>Concessions, BOT (although there are no regulations)</td>
<td>Power, and limited projects in water and transport</td>
<td>Concessions Law issued in 2007. Still no implementing regulations</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Line Ministries, Planning Development Agency, MOF</td>
<td>All types of PPP schemes</td>
<td>Transportation, roads, irrigation, drinking water, wastewater, ICT, power, oil and gas.</td>
<td>Under the new regulation (President Regulation 2011): One IPP project waiting for financial closing, 9 other projects in the pipeline.</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>Line ministries, subnational government</td>
<td>Concessions</td>
<td>Targets: energy, air transport, telecom, roads, railways, other designated activities (water, waste management, insurance, banking)</td>
<td>No specific law. Limited, projects include energy, transportation, and community market.</td>
</tr>
<tr>
<td>Malaysia</td>
<td>UKAS (PPP Unit)</td>
<td>All types of PPP schemes</td>
<td>Any sector fulfilling the criteria</td>
<td>Privatisation Masterplan and PPP Guidelines 513 projects during 1983-2010 period</td>
</tr>
<tr>
<td>Myanmar</td>
<td>Line Ministries with approval from Parliament</td>
<td>Traditional Procurement, concession (port handling)</td>
<td>Transportation, energy, water, seaport services</td>
<td>No specific law.</td>
</tr>
<tr>
<td>Philippines</td>
<td>PPP Center. Approving bodies depend on size of projects and authority level</td>
<td>Various BOT and contracts, joint venture, concession, lease.</td>
<td>All types including social sectors</td>
<td>BOT Law</td>
</tr>
</tbody>
</table>

Many projects.
<table>
<thead>
<tr>
<th>Country</th>
<th>Authority and Process</th>
<th>Contract Type/Infrastructure Types</th>
<th>PPP Regulation and Participation</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>Ministry of Finance</td>
<td>Variations of DBFO and DBO</td>
<td>Various, including social infrastructure</td>
<td>Introduce since 2004 under Best Sourcing Framework, 8 projects awarded</td>
</tr>
<tr>
<td>Thailand</td>
<td>Line ministries submit application to NESDB and MOF then to Council of Ministers → will be centralized through SEPO</td>
<td>Concessions, service and lease contracts</td>
<td>Various infrastructure types</td>
<td>(New) Act on PPP (BE 2556) private sector participation shall be centralized in State Enterprise Policy Office (SEPO) since October 2013. BTS, Motorway, Tollway</td>
</tr>
<tr>
<td>Vietnam</td>
<td>The Ministry of Planning and Investment (MPI) establishes interdepartmental working group</td>
<td>PPP as special case of BOT and BTO</td>
<td>Roads, railway, urban transport, ports, water supply, hospitals, waste treatment, power, and others decided by the Prime Minister</td>
<td>Regulation on PPP has been issued in 2011.</td>
</tr>
</tbody>
</table>

*Source: Shishido, Sugiyama, and Zen (2013) updated*
INFRASTRUCTURE FOR GAS DOMESTIC MARKET

Dr. Ir. Montty Girianna

Abstract
This paper describes a gas flow model between regions and gas infrastructure required to transport gas from regions with gas surplus (sources) to regions whose gas demand is unmet by their own supply. Projected gas demand for Java and Sumatra has to be supplied by Kalimantan and Papua whose gas production exceeds their domestic demands. The model simulates a number of scenarios for gas infrastructure development, such as gas transmission and distribution, as well as receiving LNG terminals. Depending on the distance between regions, or the costs of transportation, either gas pipe or LNG is transported. The paper concludes by identifying inter-regional gas infrastructure investment, taking current and future national policy priorities into account, and recommendation of a least-cost investment plan over medium to long term (20 - 50 years). This paper also acknowledges the limitations in the financial capacity of government and State Owned Enterprises (SOEs) to fund all gas infrastructures and stresses the need for private sector finance to play a major role. Central to bridging this gap are Public Private Participation (PPP) options. This paper investigates such private financing options for downstream gas infrastructure and the potential incentive mechanisms, which could be utilized to leverage it. Specifically the paper seeks to outline the financing needs of gas infrastructure and assess the available public sector funding, share the experience to date with PPPs in downstream gas infrastructure in Indonesia, and discuss how the issues identified can addressed.

1. Introduction

1.1. Rational for model development
A number of strategic issues emerge as the country is facing a challenge to fully benefit from its abundance natural gas reserves. The first is what is the real, and complete costs and benefits from the various end uses of its natural gas whether for LNG export, power generation, fertilizers, industries or other uses, and how such information is utilized to determine a policy for the future markets for natural gas to encourage the development of the infrastructure required. The second, how gas industry and its day-to-day operations including gas trading and retailing are to be structured to ensure a transparent

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1 The content of this paper is based on the on-going activity of Gas Development Master Plan (GDMP) study being undertaken by the office of National Development Planning Agency/BAPPENAS, it as an attempt to trigger the use of natural gas for domestic market

common approach by all parties involved. To answer those questions, a gas flow model is developed to stimulate gas production and transmission – inter-regional gas infrastructure – for the purpose of preparing an investment plan. The model interfaces with a financial and economic model for ascertaining the feasibility of different development schemes.

Although Indonesia's natural gas reserves are among the highest in the world, its domestic gas consumption is among the lowest. However, the reduction of fuel subsidies has eased fluctuating fuel prices, making natural gas become more competitive domestically as an energy alternative. As the country needs more electricity to maintain society, a great deal of this electricity demand will be satisfied by natural gas. Growing energy needs in Java and Bali will spur demand for domestic gas. Today, gas consumption in Java accounts for less than 20% of Indonesia's domestic demand, close to 1,200 million cubic feet per day (MMSCFD), which is slightly less than the outer islands where there is a concentration of industrial and fertilizer plants. In the future, ten to fifteen years, this figure will increase by between 6,000 MMSCFD and 7,000 MMSCFD and account for half of national total demand. These forecasts will bring definite opportunities to natural gas producers in the domestic market, even in light of the diversification of the international liquid natural gas (LNG) market.

Many obstacles exist that prevent the rapid development and expanded utilization of gas in domestic market. These include current energy pricing policy, gas development, and investment in upstream and downstream infrastructure. With great distances exist between most of the country’s gas reserves (Kalimantan and Papua) and gas demand centers (Java), gas infrastructure is not sufficiently developed to enable the domestic gas market to expand quickly or efficiently. Only 1,000 kilometers of transmission piping and 3,000 km of distribution piping currently serve six cities in the country -- an impediment than could further limit domestic gas growth. Development to date appears to have been carried out without a clear long-term vision of the domestic market objectives and has resulted in difficulties in attracting project investment for that purpose.

International oil and gas companies have been reluctant to expand their investment portfolios to include gas development when the market for gas is intended primarily for domestic. Contributing to this reluctance are the companies’ doubts about the size and potential of the market, the contractual framework, pricing, currency convertibility, and the lack of adequate transmission and distribution infrastructure. At that point if considerable recoverable gas remains, or there are new discoveries or untapped existing fields, the country has three choices to consider: i) Option 1 – To restructure the model of oil and gas Production Sharing Contracts (PSC) and make it attractive for international oil companies to bid for new PSCs that would be oriented towards commercialization of gas for domestic use; ii) Option II – To operate the fields using national oil companies or gas agencies; and iii) Option III – A combination of Options I
and II. Regardless which option is selected, there is a need for huge investments for upstream, midstream, and downstream gas infrastructure to continue to attract PSC partners.

The existing gas transmission and distribution systems have been principally developed by two state-owned enterprises (SOEs), i.e., PERTAMINA and PGN, although there are smaller companies with pipeline networks but these are generally dedicated to one or a group of customers. High-pressure gas pipeline system began as an expansion of production facilities to provide gas to specific local, high volume customers, such as in Palembang in South Sumatra for fertilizer, refining and power generation, Aceh for fertilizer and paper, and Bontang in East Kalimantan for fertilizer.

The first gas transmission pipeline was built by PERTAMINA linked the offshore Northwest Java (ONWJ) to Krakatau Steel at West Java in 1978, supplying gas to West Java’s distribution networks and large consumers along its route. Surabaya of East Java’s distribution system was then built to service large customers such as electricity generation at Gresik tapping gas from offshore fields in East Java. The first systems constructed using external financing, built by PGN, were gas distribution systems in Jakarta and Bogor of West Java, and Medan of Sumatra. PGN has developed in the shadow of PERTAMINA and controls gas transmission and distribution in parts of Java and Sumatra, including a pipeline network used principally for oil field production (Chevron steam flood in Sumatra) and export purposes to Singapore. Whilst PERTAMINA and PGN are both majority state-owned companies, there does not appear to be a clear division of responsibilities between them. PERTAMINA, apparently, is more concentrated on the upstream aspects of the business with PGN much more focused on downstream and transportation, i.e., transmission and distribution.

2. Scenarios of gas utilization
2.2. Initial estimates of economic gains of gas utilization
Current energy policy has shifted over time towards emphasizing the domestic use of its natural gas reserves, rather than export. This trend has been apparent over the last decade where the share of domestic gas consumed domestically has risen from 30% to 50%. Industrial users, fertilizer companies and the power generation sector have been the largest off-takers of gas in Indonesia making up 80% of domestic gas consumption. With perceived macroeconomic benefits associated with domestic utilization of natural gas, this trend is expected continue over the medium to long term. However, this comes at the expense of foregone revenues from exports. Current regional LNG spot market prices, which provide a guide as to what price might be realized by new exports, are around 15 to 16 US$/MMBTU while recent domestic gas supply contracts have been at prices of around 8 US$/MMBTU.

3 Spot prices as at end-September 2013 for imports into Japan were reported as 15.6 US$/MMBTU
Finding the right balance between exports and domestic prioritization is a challenge in the country with significant gas resources. Assuming that the government share of revenues is similar between export and domestic market sales, this becomes a question of whether the economic gains from developing a domestic gas industry are higher or lower than would be realized by the government reinvesting the additional revenues earned from exporting the gas. The answer depends, among many other factors, on assumptions as to the competitiveness of a domestic gas industry, the wider impacts on the development of supporting industries and how wisely a government will use the additional proceeds from exporting rather consuming gas domestically.

As a basis for a crude initial estimation, a recent study of the impacts of LNG exports from US is referred, i.e., exporting 1 MMBTU of gas as LNG would reduce capital and labor income by around US$ 9. The study also concluded that this would be more than offset for the economy as a whole from the resulting export revenues. If this same relationship held for domestic gas consumption in Indonesia – which might be a very strong assumption – then it would imply that the added economic value of using gas domestically is 9 US$/MMBTU. To this can be added the government revenue from gas sales in the domestic market, which is assumed to be the average government share or ‘take’ from these sales multiplied by the marginal sales price. The average government take is estimated to be around 45%, after allowing for cost-recovery. The marginal sales price is assumed to be 8 US$/MMBTU. This gives a government revenue from domestic market sales of 3.6 US$/MMBTU.

Government spending has a multiplier effect. The IMF\(^4\) estimates the fiscal multiplier of government spending – the change in total spending from a change in government spending – to lie in the range of 0.9 and 1.7 across several countries. Applying this range would imply that the government revenues from domestic gas sales would be equivalent to a further domestic economic benefit of 3 to 6 US$/MMBTU. The total economic value to Indonesia of using gas domestically would then be around 12 to 15 US$/MMBTU. By comparison if gas was exported, government revenues would be around 7.2 US$/MMBTU, assuming that exports are made at a price of 16 US$/MMBTU, which translates into a domestic economic benefit of 6 to 12 US$/MMBTU after allowing for multiplier effects. This comparison is illustrated in Figure 1 using the mid-point of the range for the fiscal multiplier and suggests that domestic consumption of gas may deliver greater economic benefit for Indonesia than its export.

\(^4\) IMF Global Prospects and Policies World Economic Outlook Chapter 1, July 2012
2.2. Scenarios of Gas Utilization

Four scenarios of gas utilization have been developed reflecting plausible development paths for Indonesia’s gas industry. They differ in the relative priority given to domestic and export markets for both LNG and gas pipeline, which in turn impacts on domestic demand. It is assumed that higher priority to domestic markets leads to higher demand as government engages in building-out and promoting gas distribution infrastructure etc. The scenarios are summarized in Table 1 below. The share of production dedicated to exports and domestic production over the period 2013 to 2070 under each scenario is shown in Figure 2. Under the base case (Scenario 1), the share of domestic demand climbs from 50% in 2013 to over 80% by around 2025 as the domestic market grows while export markets are assumed constant. The domestic market share then trends downwards as domestic demand growth plateaus and production starts to decline. Under the export-oriented scenario (Scenario 2), the picture is broadly similar.

The greater emphasis on exports means that domestic demand takes a few years longer to reach the 80% share and its decline thereafter as a share of demand is more rapid as falling production is allocated more to export markets. The domestic-oriented scenario (Scenario 4) sees the domestic market share climbing more steeply and reaching almost 90% by 2025 to 2030, maintaining a similar share out to 2050 as falling production hits exports rather than the domestic market. The high production case (Scenario 3) has a
lower domestic market share of 70% by 2025, trending up slightly after that date. This is not a smaller domestic market in absolute terms than under the other scenarios but rather represents higher volumes enabling both domestic and a growing export market to be served simultaneously.

### Table 1. Scenarios of Gas Utilization - Export Versus Domestic Use

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Associated Policy</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 1: Base Case</td>
<td>A policy mix between domestic and export volumes without increasing production above anticipated levels</td>
<td>Base Case</td>
</tr>
<tr>
<td>Scenario 2: Export oriented</td>
<td>An export driven and export prioritised policy resulting in low domestic demand volumes</td>
<td>High Case and prioritised</td>
</tr>
<tr>
<td>Scenario 3: High production</td>
<td>A policy mix between domestic and export volumes with increased production above anticipated levels</td>
<td>Base Case</td>
</tr>
<tr>
<td>Scenario 4: Domestic oriented</td>
<td>Domestic supply geared towards domestic consumption resulting in higher domestic consumption and lower exports.</td>
<td>Low Case</td>
</tr>
</tbody>
</table>

Four main parameters are sued to compare costs and benefits to Indonesia across the utilization scenarios, i.e., export revenue, domestic value-added, gas unmet demand, and emission reduction. Export revenues is the revenue accruing to government from exports over and above the value of domestic market sales. It is not the same as the full value of these exports as it is assumed that cost-recovery and the contractor’s share of profits flows out of Indonesia. Domestic value-added is the economic value to Indonesia of using gas domestically rather than exporting it. Unmet demand is the volume of domestic demand for gas that cannot be satisfied. This unmet demand has an opportunity cost—either it must use more expensive alternative fuels or is not met at all leading to a loss of economic value to Indonesia. Emissions reduction is the reduction in carbon emissions resulting from the use of gas in Indonesia. Indonesia has committed itself to reducing these emissions. It is assumed that changes in the levels of gas exports from Indonesia does not have significant impacts on emissions levels elsewhere and that a reduction in exports would be compensated by increased gas supply from other sources.

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<sup>a</sup> Priority indicates whether priority is allocating excess gas supply is given to domestic or export markets
Figure 2. Projected gas use (export and domestic) for four scenarios

The resulted projection of costs and benefits under the four scenarios are illustrated in Figure 3 below. The comparison of economic values across the four scenarios gives the following key insights. There is little difference between the continuation of the current mixed strategy and prioritization of exports – both scenarios 1 and 2 result in very similar economic added values. This is driven by the assumed lower domestic demand under the second scenario in which exports are prioritized. This reduces the level of unmet demand, which, together with increased export revenues, offsets the loss of domestic value-added from gas use. Under lower production volumes, a domestically oriented strategy provides the least economic benefits – scenario 4 has the lowest economic value, largely because domestic demand assumed to be increased as a result of the priority given to this use but production volumes do not increase accordingly. The result is large increases in projected unmet demand and the opportunity costs associated with this. Economic value is maximized where production is highest – unsurprisingly, the higher the production volumes the greater the economic benefits. Increased production enables satisfaction of domestic demand while also rising exports.
The comparison of economic values highlights the importance of considering the impacts on production of a choice between prioritizing export and domestic markets. A high domestic prioritization policy must be supported with high production volumes. Otherwise this creates demand that cannot be served resulting in high opportunity costs of unmet demand and the worst possible economic outcome. Price is the key to providing incentives to increase domestic production levels. But a policy of promoting domestic market use of gas implies lower prices for producers than would be the case where exports are prioritized, given that it is assumed increasing domestic usage is associated with declining marginal values for domestic gas use and, therefore, the price that can be supported. There are numerous examples of countries that have favored low-priced gas supplies to domestic markets over exports and, subsequently, found themselves facing severe supply difficulties and an unpalatable choice between raising domestic prices drastically or curbing gas demand through administrative restrictions. This suggests that Indonesia cannot avoid raising prices paid for supplies to the domestic market if gas production is to be sustained and increased, although it may be able to manage the impacts on individual end-users. In turn, this implies that emphasizing supply to the domestic market at prices significantly below export levels is likely to undermine production incentives and may well be counter-productive in terms of the resulting economic value created for Indonesia.
3. Scenarios of gas infrastructure development

3.1. Gas infrastructure Investment Needs

An initial estimate of financing requirements derived from the infrastructure plan defined under the Base Case scenario is identified. There is an immediate need for large-scale expansion of re-gasification terminals to enable the transport of LNG from producing areas with spare capacity at existing liquefaction terminals to domestic demand centers. The long-mooted East Kalimantan to Central Java transportation pipeline also needs commissioning to relieve this major supply bottleneck, although this may come slightly later. There is a second wave of pipeline construction in the period from 2020 to 2025, when the East Natuna development requires a new pipeline linking the Riau region to East Kalimantan to enable onward supply of gas, via the East Kalimantan – Central Java pipeline, to demand centers in Java. The additional supplies also make it possible to supply previously unmet demand in West Java leading to a need for a new pipeline from Central to West Java.

An initial view of the financing needs over the period to 2025 is shown in Figure 4 below. This shows annual expenditures of US$ 0.5 billion to 2018 as a result of adding re-gasification capacity in Java. From 2018 to 2020, annual expenditures exceed US$ 1 billion as new pipeline capacity from East Kalimantan to Java and Riau to East Kalimantan is constructed. From 2020 to 2022 annual expenditures decline again to around US$ 700 million with the ending of re-gasification investments and the completion of the East Kalimantan to Java pipeline.

![Figure 4. Downstream Gas Infrastructure Capital Expenditures (Base Case Scenario)](image-url)
3.2. Gas infrastructure Investment Needs

Before assessing private sector options it is useful to examine the capacity of public institutions for providing the necessary investment. Public sector financing of infrastructure projects is likely to come either directly from government or from one of Indonesia’s SOE working in the energy sector. Three SOEs primarily active in energy: PERTAMINA which operates in upstream production, shipping and refining of oil and natural gas, Perusahaan Gas Negara (PGN) which are the largest transportation and distribution company for natural gas in the country, and Perusahaan Listrik Negara (PLN) which operate in the power sector. PERTAMINA and PLN are wholly government-owned while PGN is 57%-owned by government.

Since the Asian financial crisis of 1997-1998, Indonesia has gradually improved its financial position with low budget deficits and a decreasing debt o GDP ratio, currently standing at around 25%. Reflecting these improvements, in 2012 the sovereign credit rating was upgraded to investment grade. During the years 2002-2008, public expenditure on infrastructure ranged roughly between 10% and 11% of total national expenditures with direct infrastructure investment by the central and sub-regional governments amounting to around 2% of GDP. Assuming a continuation of this level of commitment has occurred, such a percentage of GDP would equate to around IDR 185 trillion (US$ 19 billion) per annum in 2013. This figure is broadly consistent with those provided within the government’s current Medium-Term Development Plan for the years 2010-2014, which foresees a contribution of just under 50% from central and local government towards the IDR 1,900 trillion of infrastructure projects to be built during the period.

Through the mid-2000s energy accounted for approximately 20-25% of public sector (government and SOE) expenditure on infrastructure, of which there was roughly an 80:20 split between electricity and natural gas-related initiatives. SOEs were noted to be particularly active in the energy field with only a small (~15% of total public expenditure) contribution from central government (local government’s contribution being minimal). Assuming a proportional split between natural gas and electricity this would equate to a central government budget in 2013 of approximately IDR 1.2 trillion per year on natural gas infrastructure projects, rising in line with GDP growth. These figures indicate that while Indonesia’s economic position and ability to borrow has seen substantial improvement over the last decade, the expected finance available for natural gas infrastructure projects directly from government budget is very limited. Indeed funding may be better used purely as a tool for credit enhancement of projects through guarantee mechanisms or similar rather than to fully finance single projects.

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PT PERTAMINA is the largest SOE in Indonesia in terms of revenue and income and is 100%-owned by the Indonesian government. Its revenues for 2012 were reported as US$ 70.9 billion with an EBITDA margin of approximately 8.5%\(^7\). The company raised US$ 2.5 billion in US dollar-denominated bonds during two batches in 2011 and 2012, demonstrating their ability to raise fresh capital via this means. The credit rating for PERTAMINA is equivalent to that for the government and a high demand of bond orders was reported. This SOE operates its midstream and downstream gas operations covering trading, transportation and processing through its subsidiary, PT PERTAMINA Gas (PERTAGAS). The subsidiary invested IDR 1,073 billion (approximately US$ 94 million) in gas infrastructure projects in 2012 against a company target of IDR 1,404 billion. Most of the shortfall was due to delays in the construction of the Gresik (East Java) to Semarang (Central Java) pipeline. This pipeline is to form part of the government’s Integrated Indonesia Gas Pipeline network but a lack of upstream supplies and secured buyers has held up the project.

Investments are planned to be significantly higher in 2013 with a target of US$ 407.75 million (approx. IDR 4,650 billion), however mid-year results indicate actual investments are running substantially behind targets at only US$ 29 million\(^8\). The investments of the broader PERTAMINA group in 2012 amounted to US$ 3.13 billion, indicating that upstream investments significantly outweigh midstream and downstream investments. Planned investments for the period 2012-2016 are US$ 45.6 billion of which 79% are in the upstream sector, leaving approximately US$ 9.6 billion for midstream and downstream (covering oil and gas related projects). Investments are to be funded by “profits, bond issuance, project and corporate loans, soft loans and reserve-based financing”.

PGN has historically focused on gas transmission and distribution. However, in recent years the company has expanded into upstream, LNG processing and energy provision activities. The company is majority owned by the government who hold around 57% of shares, with the remainder floated on the Indonesian Stock Exchange. In total, PGN operates 5,912 km of transmission and distribution pipelines. The company works under a joint venture (named PT Nusantara Regas), with its fellow SOE, PERTAMINA, on an LNG re-gasification facility in Jakarta Bay, commissioned in 2012. A further JV, operating over 1000 km of pipelines, is the subsidiary, PT Transportasi Gas Indonesia. In 2012, PGN recorded net revenues of approximately US$ 2.6 billion with an EBITDA margin of 46%. Investments in fixed assets were US$ 159 million in 2012, a 104% rise on the previous year. Upstream investment is considered likely to form a small proportion of the total investment by PGN, with the majority to be focused on midstream

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\(^7\) PERTAMINA 2012 Annual Report
\(^8\) See Financial Reports available at http://www.pertagas.pertamina.com
and downstream activities where the entity has historically been most active. A recent review by Fitch suggested that PGN’s cash flows should be able to support capital expenditures of around US$ 500 million in 2013.

PLN is a wholly state-owned company operating through the generation, transmission and distribution elements of the Indonesian power sector. PLN had revenue in 2012 of IDR 232 trillion, of which approximately 44.4% were derived from government subsidies for electricity. Investment in capital expenditure for the year 2012 was IDR 48.48 trillion, a 16% decrease on 2011. Projects included new power plants and expansion of electricity transmission and distribution networks. A further IDR 25 trillion of committed projects are in the pipeline. To raise finance, since 1992 PLN has periodically issued rupiah-denominated bonds to the local capital markets to an aggregate value of IDR 18.6 trillion, IDR 4.39 trillion of which have matured. Furthermore, across a number of tranches from 2006, the company has issued a combined US$ 6 billion of global bonds from which US$ 450 million have matured to date. Despite the financial risks of PLN’s business, these bonds have been accredited with a similar rating to the sovereign rating, reflecting the strongly held belief that the government would intervene if the company became distressed. In addition PLN has taken loans from multilateral development banks, domestic banks and international lenders (including the Import-Export Bank of China and China Development Bank) to fund developments.

PLN’s focus appears to remain exclusively on the power sector where it has a major infrastructure building challenge in the coming decade. The company cannot therefore be expected to invest heavily in gas supply infrastructure, although as a principal customer of domestic gas supplies their inclusion in a project consortium or minority JV partner as a means of controlling supply risk cannot be ruled out.

3.3. Need for Private Sector Financing

Estimating the capital available for investment in particular activities by entities operating across a number of sectors is inevitably an imprecise process, not least because funds can be reallocated as priorities shift. Nevertheless indicative results can still be useful. At the low end, if Pertagas and PGN are the only entities investing in downstream gas infrastructure and if their annual capital expenditures are at the levels actually seen in 2012 then their annual financing capacity is around US$ 250 million. If their expenditures reach planned levels (for Pertagas) or those levels considered

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9 “Fitch affirms long-term foreign currency rating of PGN at BBB-/AAA(idn)”, Reuters, 5 August 2013 (http://www.reuters.com/article/2013/08/05/fitch-menegaskan-peringkat-pgn-di-bbb-aaa-idUSFTI66628920130805)

10 PLN 2012 Annual Report
supportable by ratings agencies (for PGN) then their annual financing capacity is around US$ 900 million. To this, an uncertain level of financing would be available from Government and from PERTAMINA (as distinct from Pertagas).

Between the Government and the major energy-related SOE, one may expect a maximum annual investment in gas infrastructure (excluding upstream investment but inclusive of distribution networks) of between US$ 500 million and US$ 1 billion, largely from Pertagas and PGN. Even at the higher end this figure is too low to fund the level of investment perceived in the GDMP during the period from 2017 to 2020, although it may be sufficient to meet requirements in earlier and later years.

3.4. Public Private Partnership (PPP) in Gas Infrastructure Industry

Indonesia has an established framework for PPPs in the downstream gas industry. The downstream regulator, BPH Migas, conducts tenders for the rights to develop major pipelines and local distribution networks identified in the approved gas transmission and distribution master plan. These tenders are open to any entity with the necessary technical and financial capacity. The winning bidder obtains the rights to build and operate the infrastructure under a multi-year concession. The right holders can use the infrastructure to supply gas themselves. Third parties also have the right of access subject to payment of a tariff approved by BPH Migas but this is not expected to be a major source of revenues. Liquefaction and re-gasification facilities are not overseen by BPH Migas but are approved by the Ministry of Energy and Mineral Resources.

The practical experience to date is somewhat unsatisfactory. The majority of the rights appear to have been awarded to SOEs, with the notable exception being the East Kalimantan – Central Java pipeline awarded to Bakrie & Brothers. Indeed, for other transportation pipelines, only SOEs appear to have submitted bids. This is hardly conducive to mobilizing private investment in gas infrastructure. The reasons for this are not readily apparent but seem likely to include: i) a lack of private Indonesian firms with the necessary technical capacity and industry experience, combined with a lack of interest from foreign firms; ii) a view that the tendering process is biased towards SOEs who have advantages including access to data, existing gas purchase and sales contracts and benefit from lower funding costs due to government ownership; iii) concerns over the risks of delays due to reasons outside the developer’s control (see below); and iv) a lack of profitability of gas supply at current domestic market prices.

There appears to be a lack of co-ordination in planning, with various Floating Storage Regasification Units (FSRUs) being developed which, in some cases, duplicate planned pipeline investments for which rights have been awarded.

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11 The Bakrie Group’s interest in the East Kalimantan to Java pipeline may be partly explained by its ownership of PT Bakrie Pipe Industries, which was originally expected to supply at least half the pipes required for the project. The pipeline was to be constructed by another group company,
The use of FSRUs where spare liquefaction capacity already exists elsewhere in Indonesia may make economic sense for intra-Indonesia transport in earlier years. But the current rights allocation process does not seem to consider this trade-off. There is tendering of pipelines but not of LNG infrastructure, despite the two being substitutes in many cases.

Pipeline infrastructure has been greatly delayed with the East Kalimantan to Central Java pipeline yet to start construction some seven years after being awarded. A variety of reasons have been advanced for this including:

i) a lack of upstream gas supplies, meaning the necessary gas purchase and sales agreements needed to provide a base load for the pipeline cannot be signed; ii) competing projects serving the same market (notably FSRUs) making it harder to agree gas purchase and sales contracts; iii) difficulties in obtaining permits and licenses and in land acquisition; and iv) it is also hard to avoid the suspicion that financing difficulties have played a major part—particularly given the well-reported recent problems of the Bakrie group.

Efforts by regulators to speed up construction appear to have been a failure. In April 2007, for example, the then Minister for Energy and Mineral Resources announced that gas supply and sales contracts for the East Kalimantan to Java pipeline must be signed by July 2007, one year after its award, to enable financing to be closed and construction to start. However, this appears to have had no impact. Options for how government might help addressing some of these issues, are: i) improving the planning and co-ordination of opportunities for private sector investment in gas infrastructures; ii) increasing the numbers and technical and financial capacity of private sector bidders; and iii) using government support to reallocate risks from the private to the public sector, where government is best able to bear these risks.

4. **Improving Planning and Coordination of PPP Opportunities**

It has been identified two main mechanisms that can be used to improve the planning and co-ordination of PPP opportunities in gas infrastructure: i) Integration of LNG and pipeline infrastructure planning and tendering; and ii) Advance contracting of gas users. Currently, LNG infrastructure for intra-Indonesian trade (at present, FSRUs) is not part of the transmission pipeline planning process and is not subject to a similar competitive tendering process. The implications of this are the competing FSRU projects can emerge which effectively block pipelines from being able to access gas supplies. This is the case, whether FSRUs or pipelines are more economic as a means of transporting the gas. The expansion of FSRU capacity appears itself to be in part a response to the lack of development of inter-regional pipelines, which is then made more difficult as the capacity of FSRU expands.
As well as uncoordinated development and costly duplication of effort, FSRUs are not currently included in the tendering process and, therefore, not available for private investment. With the expectation of large-scale expansion of the use of FSRUs and other re-gasification capacity, this is not desirable if private investment is required to close financing gaps. It is, therefore, necessary that transport of gas as LNG to serve the domestic market forms part of the infrastructure master plan alongside the use of pipelines and that the respective economics of the two options are compared on a consistent basis. The logical extension of this is that the rights to develop LNG infrastructure identified under the plan should be tendered to investors in the same way as pipelines, thus allowing private investment in these. This will provide a means to increase the number of opportunities open for development as PPPs.

There will be a need to consider how such tendering would be managed legally, given BPH Migas is not responsible for licensing or approving charges for re-gasification capacity and other LNG infrastructure. It may be that the ministry of energy and mineral resources can undertake this role, awarding licenses for re-gasification capacity to be used to supply the domestic market on a competitive basis with the selection criteria being the charge applied to users. A condition of the license would be that third party access is allowed to the re-gasification capacity.

Infrastructure projects should also not be brought to tender until adequate gas supplies to use the new infrastructure have been committed. This implies a need for government to coordinate the negotiation and signing of gas purchase and sales contracts – working primarily through SKK Migas which is already involved in decisions on gas allocation and the pricing of gas sold to the domestic market – that would use the infrastructure ahead of the rights to construct the infrastructure being tendered. This would have to be a government function as no holder of the rights has been identified as, of course, no tender for these rights would have been held. The tender would be launched once contracts have been signed that represent an acceptable minimum volume of gas that will use the proposed infrastructure. This could be seen as akin to the ‘open season’ process used for major gas infrastructure in some jurisdictions where potential users have the opportunity to sign up to long-term contracts to use the infrastructure and construction is approved by regulators when sufficient demand is demonstrated. This change would address one of the main causes of delays and uncertainty over the timing of infrastructure development at present – the lack of gas supplies to actually use infrastructure that has been tendered. It would also contribute to a more general improvement in planning and co-ordination of the gas industry by showing a match between supply, demand and the infrastructure to bring the two together.

An implication of this is that the holders of infrastructure rights would be more focused on the construction of the infrastructure itself rather than on negotiating gas supply contracts that use the infrastructure. As well as reducing delays, this would also change the nature of the pipeline or regasification facility from being constructed once the
holder of the rights has found sufficient users to being built to meet an identified and verified demand from users other than the rights holder. A natural extension of this, although requires legal review, is for tenders to be held only for the rights to construct and operate the infrastructure which is then operated on a common carrier model, i.e., the infrastructure owner has no interest in the gas being transported. This does not prevent a firm being both a gas supplier and transport, under separate licenses, if it wishes. It may make the funding of infrastructure more attractive to new private sector investors who may be willing to finance the pipelines or regasification terminal but be unwilling to assume the risk of finding users in a gas market with which they have little familiarity.

5. Increasing the numbers and capacity of private sector bidders

Increasing the capacity of private sector bidders implies improvements in the financial and technical capacity of private sector bidders, which may help to address some of the weaknesses seen to date, generally implies more rigorous screening of bidders including more stringent pre-qualification rounds, as well as imposing delivery obligations on successful bidders. However, for this to be effective, it is necessary to have a sufficiently large pool of private sector bidders in the first place.

Competition is absolutely vital for a successful tender process. Given the apparently small number of interested Indonesian firms, this implies, at least initially, a need to encourage international investors if private funding is to be mobilized, rather than tendering ending up as a means to allocate projects between SOE. This implies significant effort needs to be given to marketing PPP opportunities. In particular, this might include creating project ‘packages’ including preliminary analysis and marketing of these to international financial investors as well as to international firms in the gas industry through a road show process, e.g., in Jakarta and in major financial centers such as Singapore and London. This could form part of a more general message on the opportunities available in Indonesia’s gas industry.

A major reason for the lack of interest among private investors and foreign investors in particular is likely to be concerns over the inherent advantages that SOE enjoy in competing for new infrastructure rights. These take many forms but would include, for example: i) existing portfolios of gas purchase and supply contracts, giving more ready access to gas supplies then would be available to a new investor; ii) experience with and existing relationships that can facilities negotiating the required processes including obtaining gas supplies, permits and land acquisition; iii) access to data on the Indonesian gas market that is not available to other bidders including resources, customers, infrastructure options, land access issues etc.; and iv) potentially lower costs of funds due, in particular, to the implicit government guarantee available by virtue of their status as SOE. Solutions set out earlier in this paper would help address the first and second of these advantages. The third might be addressed by requiring such data to be made available to all bidders—although possibly on a confidential basis. The fourth might be
addressed by offering credit guarantees to other bidders.

If equalizing measures such as these are not sufficient, and if private investment is to be encouraged, it may be necessary to introduce more drastic measures to limit the dominance of SOE and to create space for the private sector. Such measures might include: i) requiring SOE to bid as minority partners in joint ventures with private sector firms; and ii) capping the participation of SOE by, for example, limiting the number and / or size of tenders that they can participate in or the infrastructure projects for which they can hold the rights.

6. Improving the capacity of bidders

The most common form of bidder screening is via a pre-qualification round. The objective should be to ensure bidding entities have sufficient capacity for completing the tasks being tendered but should not unnecessarily restrict competition by making unreasonable demands. A well-designed pre-qualification round will also reduce transaction costs for all parties. Areas which may be assessed include are financial capacity, legal compliance and technical capacity for undertaking the project work. An additional method of raising the quality of winning bids is to implement a multi-criteria award system where price is only one component and other factors such as plan scheduling, bidder experience and track record and business plans. Such an approach provides the buyer with a more subtle balance of risk and reward between bidder qualities than the in-or- out nature of a pre-qualification round followed by price only auction. Interviews can also form part of this process. However, the model has been criticized for lacking transparency and providing bias towards the incumbent so is not recommended for use Indonesia where the intention is to widen the pool of interested parties.12

A key danger in any auction procedure is that the winning entity has bid at an uneconomic price and is unable to deliver or the project is significantly delayed. Mitigation methods are focused on pre-emptive screening along with penalties for no delivery or late delivery. Financial penalties may be staggered against construction schedules and project milestones so as to avoid an overly blunt instrument discouraging potential credible bidders from entering the tender.

Similarly bid bonds can be used which require a cash deposit by bidders with the winner’s deposit retained as insurance against contract delivery. This helps to discourage speculative bidders from winning a tender by proposing terms that prove financially unviable.

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Reasonable time limits for project delivery should be complementary to land leases awarded to the winning bidder as part of the tender process to avoid land hoarding. An alternative approach is to use a carrot rather than stick and provide a “sprinter bonus” rather than a delay penalty for early project completion. This approach is being used to support offshore wind farms in Germany but is best most suitable for such nascent stage technology where future cost reductions are expected, else the net effect is little different to a penalty.

7. Using government support to reallocate risks

A variety of government support or incentive mechanisms are already available in Indonesia for infrastructure PPP including viability gap funding, concessional finance and guarantees as well as tax incentives. The issue with support mechanisms is, therefore, not whether these are available but more one of when and how to use them. In general, it is expected that new gas infrastructure should largely be financially viable in its own right. The general philosophy underlying Indonesia’s gas market is that users should pay a price that recovers the costs of supplying them. The exception to this might be local distribution networks developed to serve households and the supply of gas to transport where it is competing with other subsidized fuels. However, this might be better addressed through appropriate direct subsidies for the use of natural gas rather than through directing scarce government grants and concessional financing for this purpose.

There are three areas where government support might be most appropriate in terms of promoting private sector investment in infrastructure. These are: i) the provision of credit guarantees to offset the advantages of SOE; ii) The undertaking of preparatory work to limit the exposure of private developers to permitting and land acquisition risks, over which they have little control; and iii) the provision of guarantees or similar insurance against the risks of under-utilization of infrastructure due to lack of gas supplies or deliberate initial over-sizing of capacity. Provision of government guarantees for private developers might be attractive as a relatively low-cost means of increasing competition for infrastructure rights. PERTAMINA and PGN both benefit from implicit government guarantees not available to other developers. However, such guarantees would need to be carefully structured. A blanket guarantee removes a large element of the commercial risk from infrastructure developers and, therefore, incentives to develop projects in an efficient and timely manner. Instead, it may be worth exploring whether government can provide guarantees covering matters such as availability of gas supplies for infrastructure forming part of an overall development plan, issuing of licenses and permits and land expropriation which are major sources of risk to developers and are to a large extent outside their control.

Government could provide indirect support by undertaking project preparation activities before tendering the associated rights. Again, this could help address the significant
barriers created by permitting and land expropriation leaving private developers to focus on the financing, construction and operation of the infrastructure. This would appear to require changes to the current PPP model as it implies that a legal entity such as a special purpose vehicle would need to be established first, which can obtain these rights. Ownership of this vehicle would then be transferred to the successful bidder. It also means much of the engineering design much be undertaken in advance so that permits can be obtained and routes identified. The ability to make such changes within the existing PPP framework is being investigated.

A major cause of delays and risk to infrastructure developers is the uncertainty over whether gas supplies will be available. It is already mentioned, above, that government should look to address this risk by better co-ordination of gas purchase and supply contracts ahead of any infrastructure being developed. Another mechanism, which could act as a complement or even a substitute, is for government to provide guarantees or similar insurance against the risk that gas supplies are not available and, therefore, that capacity is not used. These could take the form of a guarantee of a minimum level of utilization with government paying (at the approved tariff) the difference between the revenues that would be earned at this guaranteed level of utilization and the actual utilization. It may also be that some infrastructure may initially operate at low utilization levels where it is developed as part of a wider master plan where future utilization is expected to be much higher. Financial support might also be provided to compensate for the additional costs thus caused, possibly again in the form of a minimum guaranteed level of utilization.

### 8. Summary and Conclusions

The economic value of natural gas to Indonesia is higher if consumed domestically rather than exported. However, this assumes lower domestic prices than export prices, which reduces incentives for producers and, therefore, risks insufficient supply and large unmet demand. Indonesia should, therefore, continue to pursue a mixed strategy of promoting domestic market growth while still allowing a large part (50+) of new gas production to be exported. As domestic prices increase and become more transparent, it may be possible to shift more production to the domestic market.

Major delay in tendered infrastructure projects is primarily due to lack of gas to use the infrastructure. Government must take over risks of gas supply by coordinating advance negotiation of gas supply agreements or insuring bidders against the risks of no gas (e.g. revenue guarantees) and might also take on permitting and land acquisition risks by conducting this before tendering infrastructure. Removing these risks makes threats to terminate licenses for failure to deliver infrastructure on time credible and feasible to implement and to increase bankability. FSRU and other non-pipeline infrastructure should also be subject to tendering.

Infrastructure is being mainly developed by SOE, despite government commitments to
encourage PPP. It is necessary to increase the number of private bidders through greater marketing of opportunities, especially to international bidders, and greater transparency in the bidding process including the selection criteria. In addition, is it also important to limit the inherent advantages of SOE by requiring them to make data available to other bidders, offering equivalent credit guarantees to private bidders etc. If this is not sufficient, create ‘space’ for PPP by restricting the ability of SOE to develop new gas infrastructure, such as SOE is required to partner with private investors, and the limitation of the number of amount of rights SOE can bid for and hold.

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Gas Data Book
Curriculum Vitae

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ROADS INFRASTRUCTURE AND SPATIAL ECONOMIC DEPENDENCE IN WESTERN REGION OF JAVA  
(A Preliminary Result)

Siti Herni Rochana¹, B. Kombaitan², Eka Purwanda³

Abstract

Western region of Java Island, which consists of three provinces: West Java, Banten, and Jakarta, is a region that contributes high enough to the output of Indonesia. Total GDP contributed by the three provinces in 2010 was 33.94% and the remaining 66.06% was given by the 30 other provinces. Inspite of high output in the western region of Java, there are inequalities between regions. In year 2010, Jakarta per capita income was ten times and more than that of Lebak. The existence of the problem of income disparity between regions in the west of Java brings a variety of questions relating to spatial economic dependencies and inter-regional transport connectivity in the region. The unit analysis of the research is all districts/cities in West Java, Banten, and Jakarta with the year of observation in 2010. Measurements for spatial economic dependence is Moran’s Index which is a technique of spatial correlation between spatial variables and economic variables. Spatial variables embodied in the Spatial Weight Matrix (Matrix-W), which is formed by three approaches: based on distance, neighbourhood, and road transportation network. While, economic variables in this study is the level of income per capita and economic growth. The results showed spatial economic dependence based on distance and neighborhood turned out to be low. While, the spatial economic dependence based on road connectivity, especially freeway, showed a moderate correlation.

Keywords: spatial dependence, road, infrastructure, spatial weight matrix, Moran’s Index, western region of Java.

1. Introduction

West Java, Banten, and Jakarta are provinces that produces high output in Indonesia. The GDP contribution of the three provinces to Indonesia's GDP is quite large (Figure 1). The GDP of West Java, Banten, and DKI Jakarta in 2010 were Rp. 308.96 trillion, Rp. 83.80 trillion and Rp. 391.53 trillion respectively. This figure represents the percentage proportion of 13.37%, 3.63%, and 16.94% of Indonesia's GDP respectively. Total GDP contribution given three provinces was 33.94% and the remaining 66.06% was given by other provinces, comprising 30 provinces.

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The high GDP generated from three provinces shows that the three provinces have economic activity with high intensity. This is not surprising because the country's capital Jakarta is a center of government and business as well. While West Java and Banten are adjacent to Jakarta.

![Figure 1. GRDP contribution of West Java, Banten, and DKI Jakarta to Indonesia's GDP in 2010](image)

*Source: BPS*

Behind the high output in West Java, Banten, and DKI Jakarta, there are inequalities between districts/cities. In 2010, based on current prices, the level of income per capita of DKI Jakarta is the highest at Rp. 89.92 million, while the lowest income per capita is Lebak regency at the level Rp. 6.45 million. Given these figures, it can be said that the level of income per capita of Jakarta was about 14 times of Lebak. Large differences in per capita income levels of the two areas showed disparities between regions are quite striking.

An example of inter-regional income disparities between Jakarta and Lebak raises great concern, because the geographical distance between the two areas are not too far. The distance between Jakarta and Lebak approximately 131 kilometers. Per capita income gap between regions in the study area showed the presence of regional income disparity problem.

Theoretically, spatial economic relations can be explained from the theory of trade and economic geography. From trade theory, Dixit and Norman (1980) states that the areas having trade relation tend to have same relative prices for goods and factor of production including wages. Because wages are a source of income, it can be said that the areas that have trade relations, the income should be relatively equal in both areas.

The New Economic Geography (Fujita, Krugman, and Venables, 1999) stated that inter-regional trade will occur if transportation costs low enough so that the inter-regional trade is economically feasible. Transportation cost is the determining factor for trade relations. If the transportation cost is too expensive, the trade is not economically feasible. If the transportation cost is low, the trade economically feasible. Transport costs are very closely related to infrastructure, particularly roads.
Good infrastructure in transport will cause low transportation cost. And conversely, bad infrastructure is caused high transportation costs.

The problem of regional income disparity in western region of Java raises a question about connectivity and trade relationship. If transportation accessibility links among regions available equally in all directions, the different revenue of adjacent regions should not to be large. Income gap between regions in West Java, Banten, and DKI Jakarta raises many questions relating to economic dependencies (trade relations) and inter-regional transport connectivity in this region.

2. Theoretical Framework

The economic theory that explains the effect of road infrastructure on economic spatial dependencies can be seen in Figure 2. Road infrastructure can reduce transportation costs. The New Economic Geography theory explained that the low cost of transportation will create and establish trade relations between regions. Trade between regions then would equalize the price of factors of production, including wages and interest rates. Factor price equalization can lead to spatial economic dependency.

2.1 Transportation Cost and Trade

New Economic Geography was formed by Krugman (1991) and then Fujita, Krugman, and Venables (1999). The theory explains the connection of transportation cost and trade relation. Low transport cost can create trade relation and formed agglomeration built core and periphery formation. Conversely, high transportation cost impede trade relation so that regions will produce goods autarky.

**Demand Side**

Consumer utility is a function of the quantity of goods manufacturing (M) and agricultural goods (A) in the form:

$$U = M^\mu A^{1-\mu}$$

(1)
where $0 < \mu < 1$. Manufactured goods have variation with the condition of production is creasing returns in a monopolistic competition market structure. Production of manufacture goods follow the equation:

$$M = \left[ \int_0^n m(i) \rho di \right]^{1/\rho}, \quad 0 < \rho < 1.$$  

While the budgetary constraints faced by consumers are:

$$Y = p^A A + \int_0^n p(i) m(i) \, di$$

From results of the consumer optimization, the demand function for manufacture goods and agriculture goods are:

$$m(j) = \mu Y \frac{p(j)^{1-\mu}}{G^{\mu}(1-\mu)Y} \quad \text{untuk } j \in [0,n] \quad (2)$$

$$A = \frac{(1-\mu)Y}{p^A} \quad (3)$$

By entering manufacturing demand function (2) and agriculture (3) into the utility function resulting the indirect utility function as follows:

$$U = \mu Y \left(1 - \mu \right) \frac{G^{-\mu}(p^A)^{\mu}}{G^{\mu}(1-\mu)Y} \quad (4)$$

Where $G^\mu(p^A)^{1-\mu}$ is the cost of living index. Equation (4) shows that consumer utility is affected by the price index. Form of transportation costs in the core periphery models is iceberg where transportation costs entered as a multiplier of the home price. As an example, if the price of goods produced in the North is $p^M_r$, and the transportation cost from North to South is $T^M_{rs}$, then the price of goods delivered to the South to be:

$$p^M_{rs} = p^M_r T^M_{rs} \quad (5)$$

By including transportation cost (5), the demand function for manufactured goods is:

$$q^M_r = \mu \sum_{i=1}^R Y_i (p^M_r T^M_{rs})^{-\sigma} G^{-\sigma-1} T^M_{rs} \quad (6)$$

**Supply Side**

Companies use fixed labor input $F$ and marginal $c^M$ so that the use of labor following equation:

$$l^M = F + c^M q^M$$

Profit function is revenue from selling of manuactured goods minus the cost of labor:

$$\pi_r = p^M_r q^M_r - w^M_r \left( F + c^M q^M_r \right)$$

Profit maximization is obtained:

$$p^M_r = c^M w^M_r / \rho \quad (7)$$

By entering the price equation (7) into the profit function:

$$\pi_r = w^M_r \left[ \frac{G^\mu F}{\sigma - 1} - F \right] \quad (8)$$

The balance of the manufacturer (at zero profit condition) is obtained:

$$q^* = F(\sigma - 1)/c^M \quad (9)$$

$$l^* \equiv F + c^M q^* = F\sigma \quad (10)$$
By using the price equation (7), it can also be obtained wages of manufacturing workers in the North as follows:

\[ w_r^M = \left[ \sum_{s=1}^{S} Y_s (T^M_{rs})^{1-\sigma} G^\sigma_s \right]^{1/\sigma} \]  

(11)

### 2.2 Trade and Factor Price Equalization

Dixit and Norman (1980) built proposition that trade will make factor price equalization. Suppose a country produces goods to the price of goods 1 and 2, respectively \( p_1^a \) and \( p_2^a \) on condition of autarky and \( p_1 \) and \( p_2 \) on condition of balanced trade. While imports for the two goods is \( m_1 \) and \( m_2 \). Feasible conditions for trade is:

\[ (p_1^a - p_1)m_1 + (p_2^a - p_2)m_2 \leq 0 \]  

(12)

Prices of goods are a reflection of the wages that can be written as follows:

\[ p_1 = b_{11}w_1 + b_{12}w_2 \]  

(13)

\[ p_2 = b_{21}w_1 + b_{22}w_2 \]  

(14)

Where \( b_{ij} \) is the input coefficient denoting the amount of factor \( j \) required for unit output of good \( i \). Output price ratio can be written as:

\[ \frac{p_1}{p_2} = \frac{b_{11}w_1 + b_{12}w_2}{b_{21}w_1 + b_{22}w_2} \]  

(15)

Define the relative output price \( \pi = p_1/p_2 \) and relative factor price \( w = w_1/w_2 \), equation for \( \pi \) is:

\[ \pi = \frac{(b_{11}w + b_{12})}{(b_{21}w + b_{22})} \]  

(16)

Changes in relative output prices resulting from changes in relative factor prices can be described as follows:

\[ \frac{1}{\pi} \frac{d\pi}{dw} = \frac{b_{11}}{b_{11}w + b_{12}} - \frac{b_{21}}{b_{21}w + b_{22}} \]

\[ = \frac{1}{w + b_{12}/b_{11}} - \frac{1}{w + b_{22}/b_{21}} \]

\[ = \frac{b_{22}/b_{21} - b_{12}/b_{11}}{(w + b_{12}/b_{11})(w + b_{22}/b_{21})} \]  

(17)

### 3. Methodology

#### 3.1 Data

Observation area covers all districts/cities in West Java, Banten, and DKI Jakarta. In West Java there are 17 districts and 9 cities. Banten Province consists of 4 districts.
and 4 cities. While Jakarta in this study are treated as one region. Year of observation in this study is 2010.

3.2 Spatial Dependence Measurement

Measurement of spatial economic dependencies is done by using Moran’s Index (Moran, 1950). Principally, Moran’s Index is modification form of correlation between economic variables and spatial variables. Moran index formula (Fischer and Wang, 2011) is as follows:

\[ I = \frac{n}{W_0} \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} W_{ij} (z_i - \bar{z})(z_j - \bar{z})}{\sum_{i=1}^{n} (z_i - \bar{z})^2} \]

Where:
\[ W_0 = \sum_{i=1}^{n} \sum_{j=1}^{n} W_{ij} \]
\[ z_i : \text{economic variables } i \]
\[ \bar{z} : \text{average economic variables} \]
\[ w_{ij} : \text{spatial weight matrix} \]
\[ i : \text{districts/cities } i \]
\[ j : \text{districts/cities } j \]

Moran’s Index would have value \(-1 \leq I \leq 1\). Moran index value of +1 indicates a perfect correlation between regions, while the value of -1 indicates a perfect dispersion. While a value of 0 indicates a random relationship. Expected value and variation for Moran Index are:

\[ E(I) = - \frac{1}{(n - 1)} \]

\[ \text{Var}(I) = \frac{n^2 (n - 1)W_1 - n(n - 1)W_2 - 2W_0^2}{(n + 1)(n - 1)^2 W_0^2} \]

Where:
\[ W_0 = \sum_{i=1}^{n} \sum_{j=1}^{n} W_{ij} \]
\[ W_1 = \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} (W_{ij} + W_{ji})^2 \]
\[ W_2 = \sum_{k=1}^{n} \left( \sum_{j=1}^{n} W_{kj} + \sum_{i=1}^{n} W_{ik} \right)^2 \]
3.3 Spatial Weight Matrix Specification

Measurement of spatial dependencies can be done by using correlation or regression. However, the spatial correlation or regression is done by inserting a spatial variable. The spatial variable is manifested in Spatial Weight Matrix or so-called matrix W. In principle, there are two stages in the formation of matrix W: forming the matrix C (Spatial Contiguity Matrix), then form a martiks W (Anselin, 1988; Chen, 2012). Formation of the matrix W can be described as follows:

Spatial Weight Matrix:

\[ W = \frac{C}{C_0} = \begin{bmatrix}
    w_{11} & w_{12} & \cdots & w_{1n} \\
    w_{21} & w_{22} & \cdots & w_{2n} \\
    \vdots & \vdots & \ddots & \vdots \\
    w_{n1} & w_{n2} & \cdots & w_{nn}
\end{bmatrix} \]

Spatial Contiguity Matrix:

\[ C = \begin{bmatrix}
    c_{11} & c_{12} & \cdots & c_{1n} \\
    c_{21} & c_{22} & \cdots & c_{2n} \\
    \vdots & \vdots & \ddots & \vdots \\
    c_{n1} & c_{n2} & \cdots & c_{nn}
\end{bmatrix} \]

Where:

\[ C_0 = \sum_{i=1}^{n} \sum_{j=1}^{n} c_{ij}, \quad \sum_{i=1}^{n} \sum_{j=1}^{n} w_{ij} = 1 \]

In the formation of matrix C, there are several methods that can be done. In this study, matrix C formed by three approaches: based on distance, based on adjacent territories (neighbor), and based on road transportation network.

3.3.1 Spatial Contiguity Matrix based on Distance

Formation of matrix W is usually made based on distance. This formation starts from make a matrix C which has elements of distance decay. Distance decay is the inverse distance or inverse distance squared (Luc Anselin, 2003, 2010). Matrix C is made based on the distance is as follows:

\[ C_d = \begin{bmatrix}
    0 & 1/d_{12} & \cdots & 1/d_{1n} \\
    1/d_{21} & 0 & \cdots & 1/d_{2n} \\
    \vdots & \vdots & \ddots & \vdots \\
    1/d_{n1} & 1/d_{n2} & \cdots & 0
\end{bmatrix} \]

Where:

\[ d_{ij} : \text{distance between districts/cities } i \text{ and } j \]
3.3.2 Spatial Contiguity Matrix based on Neighbourhood

Matrix W can also be made by neighborhood approach. In this case, Matrix W formation starts from building matrix C which contains weighted elements. The weight valued 1 for the adjacent areas and 0 for others (Lesage, 1988).

\[
C = \begin{bmatrix}
c_{11} & c_{12} & \cdots & c_{1n} \\
c_{21} & c_{22} & \cdots & c_{2n} \\
\vdots & \vdots & \ddots & \vdots \\
c_{n1} & c_{n2} & \cdots & c_{nn}
\end{bmatrix}
\]

Where :
- \(c_{ij} = 1\), if area j shares a common boundary with area i
- \(c_{ij} = 0\), otherwise

3.3.3 Spatial Contiguity Matrix based on Transportation Network

Recently, matrix W was also developed to be able to capture the transportation network. In this study, matrix W was built from matrix C which has elements weighted based on the type of road connecting between districts/cities. Formation of matrix C is as follows :

\[
C = \begin{bmatrix}
c_{11} & c_{12} & \cdots & c_{1n} \\
c_{21} & c_{22} & \cdots & c_{2n} \\
\vdots & \vdots & \ddots & \vdots \\
c_{n1} & c_{n2} & \cdots & c_{nn}
\end{bmatrix}
\]

Where :
- \(c_{ij} = 1\), if districts/cities i and j are connected by freeway
- \(c_{ij} = 0\), otherwise

3.4. Operationalization of Variables

Table 1. Operationalization of Variables

<table>
<thead>
<tr>
<th>No.</th>
<th>Variables</th>
<th>Notation</th>
<th>Indicators</th>
<th>Measurement</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Income</td>
<td>(z_1)</td>
<td>Per capita output</td>
<td>GRDP Population</td>
<td>Rp/person</td>
</tr>
<tr>
<td>2</td>
<td>Economic Growth</td>
<td>(z_2)</td>
<td>Growth of per capita output</td>
<td>PCGRDP(<em>t)-PCGRDP(</em>{t-1})</td>
<td>Percent</td>
</tr>
<tr>
<td>3</td>
<td>Distance</td>
<td>(d)</td>
<td>Distance</td>
<td>Distance between regions</td>
<td>Kilometers</td>
</tr>
<tr>
<td>4</td>
<td>Neighbor</td>
<td>(b)</td>
<td>Regions are adjacent each other</td>
<td>(c_{ij}=1), if regions were adjacent</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(c_{ij}=0), others</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Road 1</td>
<td>(r_1)</td>
<td>Regions connected by freeway</td>
<td>(c_{ij}=1), if regions were connected by freeway</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(c_{ij}=0), others</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Road 2</td>
<td>(r_2)</td>
<td>Regions connected by non-freeway</td>
<td>(c_{ij}) be weighted based on kind of roads</td>
<td></td>
</tr>
</tbody>
</table>

Annotation: GRDP = Gross Regional Domestic Product,
PCGRDP = Per Capita Gross Regional Domestic Product
4. Result

Figure 3 is a map of West Java which describes the distribution of income per capita in 2010. Districts/cities dark colored shows income per capita is higher. DKI Jakarta was the highest in per capita income with Rp. 89.9 million per capita per year. While the lowest income is Lebak occupied by the value of Rp. 6.5 million per capita per year.

Figure 3. Income per Capita of Districts/Cities in Western Region of Java Year 2010

Figure 4 shows the economic growth of the district/city in the western region of the island of Java in 2010. Districts/cities have higher economic growth characterized by increasingly intense color. Bogor City is the highest economic growth with the
growth rate of 18:19%. While Jakarta has the lowest economic growth with the growth rate of 6:21%.

Moran Index value for each matrix W on income and economic growth can be seen in Table 2. From Table 2 it was found three significant Moran Index value for income dependency: based on the distance between regions is 0.0353, income dependency based road connectivity 0.0628, and the dependency of economic growth based on freeways connectivity is moderate at 0.2260.

Table 2. Moran’s Index Value for Spatial Economic Dependence in Western Region of Java Year 2010

<table>
<thead>
<tr>
<th>Matrix-W</th>
<th>Economic Variables</th>
<th>Income</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance</td>
<td>0.0353</td>
<td>-0.0276</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3.7411)***</td>
<td>(0.2731)</td>
<td></td>
</tr>
<tr>
<td>Neighbour</td>
<td>0.0798</td>
<td>-0.2067</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.8555)</td>
<td>(-1.0329)</td>
<td></td>
</tr>
<tr>
<td>Road-1 (Freeway)</td>
<td>0.1546</td>
<td>0.2260</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.0915)</td>
<td>(1.4721)*</td>
<td></td>
</tr>
<tr>
<td>Road-2</td>
<td>0.0628</td>
<td>0.0899</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(10.4089)***</td>
<td>(0)</td>
<td></td>
</tr>
</tbody>
</table>

*, ***, are significant at $\alpha=0.1$ and $\alpha=0.01$; z-statistic in parentheses

From three significant Moran Index value, two Moran Index value is very low, 0.353 for income dependencies based on distance and 0.0628 for income dependencies based on road-2 connectivity. A low value of Moran Index indicates that the relationship of income among regions based on distance based on road-2 is very small. Increased income of an area is associated with increased income in other regions but the correlation was very small.

From Table 2 it can also be seen the high value and significant of the Moran Index for dependencies of economic growth among areas linked by freeway with value of 0.2260. The value illustrates that among areas connected by the freeways have a high interdependencies in economic growth. A high dependence relationship in economic growth among regions indicates that the economy are interrelated. Specifically, the relationship in question is economic trade relations.

Back to the New Economic Geography theory, inter regions would have trade relation if transportation costs low and vice versa. The observation by Moran Index indicates that the region is linked by a freeways have a high economic dependency. This occurs because the areas are connected by freeways have lower transport cost than areas that are not connected by freeways. Lower transport costs lead to trade between regions became feasible economically.
Moran index for economic growth dependencies among regions calculated based on distance is not significant. This situation occurs because the distance of two adjacent regions is not necessarily associated with lower transport costs. In contrast, regions that are far from each other may have lower transportation costs because they were connected with a good transportation network.

Another interesting finding from this study is that there are tendency for difference in levels of income per capita between the North and the South. The picture suggests that economic activity is more concentrated in the North. Economic activity tend to be pooled in the North can be caused due to the freeway network is more widely available in the North than in the South. This situation created an economic gap between the North and the South in the western region of Java.

5. Conclusion

In western region of Java, a significant relationship of per capita income occurred among regions correlated based on distance and non-freeway road connectivity, but the degree of interdependence is very low. On the other hand, a significant relationship in economic growth occurred among regions connected by freeway at moderate level.

References


ACCOMODATING THE ROLE OF SMALL CITY DEVELOPMENT IN ECONOMIC CORRIDOR OF WEST JAVA'S MP3EI
The Case Study of Higher Education Center of Jatinangor

Alia RASMAYA¹, Astria Aulia S. and Ridwan Sutriadi

Abstract

Challenge to realize of economic development growth for the welfare of the people is not easy. In this context required Master Plan for the Acceleration and Expansion of Indonesian Economic Development (MP3EI) to provide direction of economic development in Indonesia 2025. Another challenge in the development of the economy is the lack of infrastructure capable of supporting the growth of economic activity. One of the infrastructure that needs to be considered is the inter-regional connectivity. This infrastructure will push down the cost of transportation and logistics costs in order to improve product competitiveness and accelerate economic mobility. Jatinangor has characterized as a small city which has a strategic role in the context of regional development. Small city regarded as the link between rural areas and big cities. This paper aims to analyze the role of ICT Jatinangor as a small towns that support economic corridor West Java Jatinangor an integrated part and was deeply affected by the economic development of Bandung .In Spatial plan of west java province, Jatinangor is a strategic area of province as KPT (KawasanPerguruanTinggi). The function of KPT are education center, main activity for businessand support development in other sectors. Methodology used in this research is quantitative by using questionnaires to the resident of formal housing to indicate the level of use of ICT in Jatinangor. The results in this study indicate that the Jatinangor as a small city has used ICT to support the economic activities of the majority of communities.

Keyword: ICT, Small City, Jatinangor, KPT.

I. Introduction

The Indonesian economy is progressing very rapidly, starting from an agricultural country that is a country with the largest agricultural sector and is currently toward the country with the mining industry and larger. Economic progress has also brought public welfare, it is reflected in the increase in per capita income from year to year. In addition, higher-quality indicators visible on the Human Development Index (HDI) which is from the period 1980 to 2010 increased from 0.39 to 0.60 (BPS, 2010). For this reason Indonesia is required to achieve a change in sustainable development. However, the challenges in realizing the growth of Indonesia's economic development for the welfare of the people is not easy and requires very hard efforts from the central government. In this context required Master Plan for the

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Acceleration and Expansion of Indonesian Economic Development (MP3EI) to provide direction of economic development in Indonesia 2025. MP3EI Master Plan will evolve as government programs to develop people's economy by building a number of infrastructure in many remote areas is a tactical step to continue to focus on economic growth in Indonesia will be represented in six economic corridors are expected to support economic growth.

In UU No. 17/2007 on the National Medium Term Development Plan, which is one of the main strategies MP3EI concept that has been set. Indonesia's economic structure is still focused on industrial and agricultural collect natural products. Industries that produce value-added products, production processes and distribution is still limited. But there is another challenge that is no less important is the lack of infrastructure capable of supporting the growth of economic activity. One of the infrastructure that needs to be considered is the inter-regional connectivity. This infrastructure will push down the cost of transportation and logistics costs in order to improve product competitiveness and accelerate economic mobility. In the context of the provision of connectivity between corridors is a priority not only for MP3EI, but the presence of small towns located along the economic corridor is one focus in supporting inter-regional connectivity. In addition, the role of the small town influence the movement of the economy in every corridor that has been established with the development of the creative economy and small industry.

The main purpose of this paper to develop MP3EI studies focusing on the development of small towns in West Java with the help of ICT. Contained a small town in the discussion of this paper is Jatinangor Urban Area which has a function as a regional higher education at Bandung Metropolitan Region and most of the people have been using ICT as one life style which is used to support economic activity and to support inter-regional connectivity and the use of ICT to improve the role and function of the area on a regional and national level.

II. Background
Small Town Development in the Metropolitan Context
Based on the Spatial Planning Law No. 26 In 2007, the urban area is the area that has major non-agricultural activities in the area as a function of the composition of urban settlements, the concentration and distribution of government services, social services, and economic activities. Basically the city was born and developed from a previously rural areas is a natural panorama, garden or hilly areas with cool air and natural beauty has been transformed by humans into Office buildings, housing, markets, shopping centers and places where other facilities. The existence of very rapid growth of the city led to form small towns around the city centers.

The small town has a strategic role and position in the development of rural areas. Small town as the lowest order of the city is a bridge between rural areas that are agricultural in other larger cities. Small town in addition to functioning as an administrative center is also a collection center for the production of rural areas and then distributed to other areas. This product can be a rural area of agricultural
commodities and household products. The small town also served as a distribution center of information and manufacturing products from a large city to be distributed to the rural areas.

Definition of a small town can be obtained by knowing the size or dimensions of the city. Based on population size, the small town is a city with a population of not more than 100,000 inhabitants (Rondinelli, 1983). The small town has a strategic role in the context of regional development. The small town is considered as the first urban center and parts of the rural areas. According to (Rezvani et al, 2009) a small town regarded as the link between rural areas and big cities. Each activity in the first centers will directly affect rural areas. The role of small towns is very important in rural-urban relations as it gives advantage to one another so as to reduce the gap (lynch, 2005). Whereas in the context of urban systems, the role of the city in terms of scale over each city services. Small town can be developed as a regional service center, while the other is a local service center. Principal role of the small town itself is a center of commerce, employment and as a service center. Based on this third role, is expected to form the urban hierarchy, which in turn confirms the role of the small town as a bridge between rural areas and urban areas larger (SMESTO, 2006).

In the development of small areas of the city have a strategic role in its development. The strategic role of the small town is (Mathur, 1982):

1. Prevent the occurrence of urban primacy.
2. Facilitate the development of metropolitan decentralization process through.
3. Creating linkage between rural and urban areas.
4. Establish a national spatial integration through the creation of a more proportional distribution of the population.
5. Give rural areas a higher access to city facilities better.

According to Rick Hundey Management and Planning Services (2004) and City of Leominster Office of Planning and Development, there are some important things that most affect the success of the development of a small town.

1. Concentration
Concentration is about overcoming development challenges arising due to differences in the diversity of the characteristics of each region or city. This is the concentration base of small city development strategy. Where most of the small town development based on economic based. Socio-economic development and technological change have implications for transportation and communication systems, the development also occurs in rural-urban relations. This relationship is shown as a current resident, goods, capital, information and innovation (Rezvani et al, 2009). In addition to the small town is considered as the center of the urban and rural areas are also considered as a link between rural and urban. the existence of these centers have influenced the development of the village began urban and development of small cities are considered as a solution to reduce urbanization and increasing access to the town a small town in the continuation of its development.

2. Connection
Connection is to reduce the distance between the region with an internet connection, and the connection between the use of mobile phones, to do research and business interests. Connection here is different from using infrastructure such as transport connections, this connection uses the role of ICT as a factor that will determine the development of a small town. The importance of connections and the benefits of information technology is due to the small towns tend to be less advantage with major cities: concentration of college-educated workers; several groups of economic activities that enable innovative information exchange among sectors, a diversified industrial and knowledge base, and a critical mass local consumers. That requires the support of information technology in order to develop a more developed small town.

3. Cooperation
Cooperation is the most important thing in dealing with concentration and connections between regions and requires the integration and cooperation. Small town benefit from interdependence and complementarities with the surrounding region, relations between regions that expand the scope of its position in the region and the global economy, due to the increasing economic, human resources and strength of his government.

Role of ICT in Development of Small Cities
Information and Communication Technology (ICT) is defined as a combination of information technology with other relevant technologies, especially communications technology (UNESCO, 2002). According to Oxford (1995) defines information technology is the study or the use of electronic equipment, especially computers to store, analyze, and distribute information in any form, including words, numbers, and pictures.

The consequences of the application of information technologies in production and services has changed the traditional way of doing business in the industry, services and other organizations as well as changing daily life, even in the field of spatial planning. Graham (2004) states that information technology has been able to address the needs in the area of spatial proximity with one another. For many visionary states that the information society is a new economic era in the history of mankind (Castells, 2001). The information age is the fourth era after era of agrarian, industrial and services (Molitor, 1999 in Castells, 2001). Therefore the impact of ICT on development and spatial changes are part of the development of the information society.

Many planners anticipate the advancement of communication and transport in the future by utilizing the principle of workability of the technology that drives the city community (Gold, 2002). The consequences of the application of ICT in the production and services will change the traditional ways of doing business in the fields of industry, services and other organizations as well as changing daily life (Castells, 2001). These developments form the basic driving force and spatial changes have been discussed by many scientists and futurologists. Therefore the impact of technological developments on the development of spatial information can
be utilized primarily to provide an opportunity for urban development goals just might not have been possible before (Talvitie, 2004).

III. Data And methodology
In this study, the approach taken is explaining a situation (explanation research), because in this study described the depiction state after going through the stages of analysis includes identifying the position of the small towns in West Java and the stages of its use of ICT. Moreover, in terms of the uniqueness of the selected cases, this research belong to the actual case studies already happening in some places in Indonesia. Robert K. Yin in his book, Case Study Design & Methods (1987), states that a case study aimed at understanding the complex object or problem, and can extend experience or add strength to what is already there through previous research.

This research was conducted using qualitative methods and quantitative using descriptive methods, by providing explanations and interpretation based on the theory and the fact that the description be systematic, factual, and accurate. By using a method that is both qualitative and quantitative descriptive method, this research will be obtained from the analysis of data and the fact that there is collaboration between the fields coming from the community itself. In conducting this study, researchers used a variety of instruments as follows.

1. Instrument of primary data sources. The primary data source can be either photographs, interviews, or data obtained directly from the field, such as the map location.
2. Instruments of secondary data sources. Secondary data can be obtained documents from various agencies that have the authority to publish the data. Besides secondary data can be used as a reference to find the primary data.
3. Supporting electronic instruments. This instrument is used in data collecting or data processing. Laptops, digital cameras, voice recorders, and other devices can be used mainly in the process.
4. Other supporting instruments. In order to facilitate the study site, then the vehicle is required to be one of the important supporting instrument. Additionally, stationery, logbook, and other tools are needed to support the research.

Population and Sample
Specifically, the population to be studied in this case is the formal housing in the District Jatinangor. Population in the formal housing Jatinangor not known for certain, it is used for non-random sampling design methods, this method does not follow the theory of probability in the selection of the elements of the sample population. This technique is used when the number of elements in the population is not known or is not identified individually. In such a situation, the selection of elements is dependent on other considerations. Because in doing an interview takes informant who has information related to the research. The technique used in the determination of the sample (speaker) is using purposive sampling.
purposive formed by selecting targets with assessment (judgment) imposed by these researchers is determined by the investigator according to certain criteria considerations predetermined. Resource persons sampled in getting the information is the person who has a house in a residential Jatinangor formal urban areas. By using this method, the targets will be successful in this research order.

Method and Data Collection Step
a. Observation
Observations made at the beginning of the study. These observations include a visit to the area of research, or may be called grand tour. The purpose of this observation is to observe more closely the conditions that exist in the field, estimating tools or instruments needed for research. In this case the observation is made in sub Jatinangor.

b. Questionnaire and Interview
To analyze the pattern of movement work, in the community or the required survey of households living in formal housing in Jatinangor (home based), in the form of questionnaires. Results will be analyzed to bring goals and objectives. In addition to the use of questionnaires, interviews are also required to find out additional information.

c. Documentation
Documentation is done on location shooting the study, using the camera. The purpose of this documentation is to see firsthand how a physical state in the field and document them.

IV. Analysis
Overview District Jatinangorin Support MP3EI
Administrative economic corridor includes the Java Banten, Jakarta, West Java, Central Java, Yogyakarta and East Java. In general, the average GDP in the corridor Java far exceeds the average GDP Corridor others. In Master Plan Economic development acceleration and expansion of Indonesia (MP3EI) Java Corridor can be prepared to benchmark the economic changes of the manufacturing industry to the service or from primary to tertiary. Master Plan acceleration and Expansion of Indonesian Economic development (MP3EI) aims to address issues of economic development corridor of Java with a focus on the potential economic activities in the corridor area. Economic corridor was prepared as a driver of National Service Industries with major economic activities include food and beverage industry, textiles, transportation equipment, shipbuilding, telecommunications, defense equipment and the Greater Jakarta area.

Based on data from Java Corridor GDP growth rate in 2010-2011 (LPE) Java corridor averaged 9.84 % with the highest occupied LPE DKI Jakarta with 12.25 % and the lowest occupied West Java with 6.09%. Level of GDP gap has long been the economic problems in this corridor, not only between provinces but also between districts. In general, areas that are located in the northern part of Java such as Jakarta, Semarang and Surabaya have a level of economic development better than the southern areas. Differences in development level is one of them also an effect of the
difference between the infrastructure of the north and south. Infrastructure in the north is more adequate and superior as the trajectory of the availability of the north coast (coast), major ports (TanjungPriok, TanjungEmas, Tanjung Perak) that support the availability of markets and access to markets.

See major problems corridor of West Java which is a case study in macro in this study because of limited access to markets and the flow of goods, it is necessary for the role of small towns in West Java Area corridor to resolve this issue, this is due to the small city considered as the link between rural areas and big cities. Each activity in the first centers will directly affect rural areas. The role of small towns is very important in rural-urban relations as it gives advantage to one another so as to reduce the gap.

To the view of the role as the primary access Jatinangor that connects Bandung to coast , as well as small towns in West Java, the other indirectly Jatinangor this small town has a major role in supporting access to the flow of goods between the coast with Bandung . In the context of MP3EI accessibility is crucial for the smooth flow of goods with the smaller distribution costs, so that these products can compete with other products with production costs are not too high.

Characteristics of the use of ICTs in Formal Area Housing in District Jatinangor
To support a supporting role as a corridor MP3EI Jatinangor not be separated from the role of ICT in the development of economic influence, ICT development is so fast that it does not directly require humans to use it in all its activities. The consequences of the application of information technologies in production and services has changed the traditional way of doing business in the industry, services and other organizations as well as changing daily life , even in the field of spatial planning. Graham (2004) states that technology information has been able to address the needs in the area of spatial proximity with one another. Therefore the impact of technological developments on the development of spatial information can be utilized primarily to provide an opportunity for urban development goals just might not have been possible before (Talvatie, 2004).

In the context of urban development in the western Java including Jatinangor urban development based on national and regional policy, 5 mega development projects, including the construction of an international airport western Java ( BJB ) Kerta teak, Jatigede dam construction , highway construction Cikampek-Palimanan, Development of Cisumdawu highway and railway development Ranchi- Tanjungsrari - Cirebon. Meanwhile, for the development of the area Jatinangor, Jatinangor the spatial position has been designated as a regional center of urban basin Bandung Raya. Jatinangor an integral part and greatly influenced the development of economically Bandung Raya. In West Java Spatial set Jatinangor be the center of higher education strategic region province or KSP. Jatinangor an area defined as a region of West Java province, education, main activity for bussines or Jatinangor development geared to supporting education and other urban development sector
development. Moreover, it is proved by the urban planning efforts made by the government Jatinangor Sumedang district with background physical changes occurred between 1970 and the early 1980s. In general, the change is due to the expansion of trade, government and industry that shows characteristic urbanity (Bappeda, 2010).

Jatinangor Urban Area has a homogenous community characteristics due to the designation of the region as an area of higher education, it also has implications for the characteristics of a rural area that was initially changed to remedy urban village at the center of the college district. The details of the characteristics of the region as follows.

### Table of Regional Characteristics in Jatinangor 2010

<table>
<thead>
<tr>
<th>Desa/Kelurahan</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cipancing</td>
<td>Rural</td>
</tr>
<tr>
<td>Sayang</td>
<td>Urban</td>
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<tr>
<td>Mekargalih</td>
<td>Urban</td>
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<tr>
<td>CintaMulaya</td>
<td>Urban</td>
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<tr>
<td>Rural</td>
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<td>Rural</td>
<td>Rural</td>
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<tr>
<td>Hegarmanah</td>
<td>Urban</td>
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<tr>
<td>Cikeruh</td>
<td>Urban</td>
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<tr>
<td>Cibeusi</td>
<td>Urban</td>
</tr>
<tr>
<td>Cileles</td>
<td>Rural</td>
</tr>
<tr>
<td>Cilayung</td>
<td>Rural</td>
</tr>
</tbody>
</table>

*Source: BPS, 2010*

From the table above, it can be seen that have urban characteristics located in the village of Baby, Blossom Village Galina, Cintamulya Village, Village Hegarmanah, Cikeuruh Village, Village Cibeusi. These villages have a central characteristic of rural areas due to college and supporting facilities such as boarding houses and other facilities are in the village and surrounding areas. This affects the characteristics of the people to be characterized by urbanity. Characteristic urbanity in question here is in the use of ICT and Facilities consumption and impact on the selection of the location of the population. The survey was conducted using variables that describe the characteristics of movement patterns according to Zhu (2013) are:

1. Socio- economic status;
2. Structure of household;
3. Residences;
4. Lifestyles;
5. Individual demographic (age, gender, education, married or not, work).

Home base of survey has been done to the formal housing communities located in urban areas Jatinangor, which consists of 6 is considered to represent the formal housing showed that the characteristics of residential locations separated by a community job characteristics. Besides education and job characteristics also affect the use of ICT in the society. The use of ICT is used to facilitate the work and
simplify the intake facility. Telecommuter here a long time and affect the length of the trip due to the presence of telecommuting, they could choose a place to stay away from the workings, and chose to go back and forth. This will result in changes in the site selection trend is people prefer to stay in the region according to their preferences more comfortable.

**ICT as One Supporting Access Alternative a Small Town for MP3EI**

In MP3EI corridor infrastructure development to support economic activity. Availability of infrastructure has very broad implications. One thing that should get the main concern is the infrastructure that encourages connectivity between regions so as to accelerate and expand the economic development of Indonesia. Infrastructure that encourages connectivity will reduce transportation costs and logistics costs in order to improve product competitiveness and accelerate economic movement. Included in this is the development of infrastructure connectivity and transport pathways of information and communication technology (ICT), as well as all regulations and rules associated with it.

Connectivity must be supported by a system of communication technologies with a pattern of integration between aspects of the economy by considering the characteristics of each region, the pattern of regional development, social aspects of the community, region-specific factors, and the selection of appropriate technologies. Strengthening of the action plan in the area of inter-city connectivity MP3EI intended for some of the following: (1) connecting the centers of major economic growth in order to maximize growth, (2) expanding economic growth through increased accessibility of the centers of economic growth, and (3) is widely spread the benefits of development (inclusive and equitable growth) through increased connectivity and basic services to the disadvantaged, remote and border areas in order to equitable development.

The entire expansion activities in MP3EI connectivity implemented through the development of synergy development between central and local governments as well as between regions. Synergy development between regions through improving connectivity that utilizes position within the spatial Jatinangor District will establish connectivity between the economic corridors of West Java and also expected to serve as an instrument of economic push and pull balance area. This not only can encourage economic activity more evenly to all parts of Indonesia, but can also create self-sufficiency and economic competitiveness of the region are integrated with each other.

In addition, the role of information and communication technology in accordance with the MP3EI is increasing strengthening inter-regional connectivity and strengthening of human resources and science and technology. In the telecommunications sector, the role of broadband connectivity plays an important role in development between regions. ICT connectivity for mega infrastructure regarded as the nation's competitiveness and support for the knowledge-based economy. With the issuance MP3EI will certainly influence policy related to
broadband development in Indonesia, including connectivity by using the frequency spectrum as the most suitable option, at least from an economic perspective during the construction of fiber-optic-based infrastructure has not had a more significant role.

V. Conclusion and Suggestion

Conclusion
1. Implications for the determination of the administrative functions in accordance with the land use change in direction determination function. Changes in land use not only leads to a defined function, but there are others that follow land use to support the establishment of special functions.
2. Jatinangor an integral part and greatly influenced the development of economically Bandung Raya. In West Java Spatial set Jatinangor be the center of higher education strategic region province or KSP. Jatinangor an area defined as a region of West Java province, education, main activity for business or Jatinangor development geared to urban development and support education development in other sectors.
3. To support a supporting role as a corridor MP3EI Jatinangor not be separated from the role of ICT in the development of economic influence, ICT development is so fast that it does not directly require humans to use it in all its activities. The consequences of the application of information technologies in production and services has changed the traditional way of doing business in the industry, services and other organizations as well as changing daily life, even in the field of spatial planning.

Suggestion
1. Challenges in developing MP3EI is the lack of infrastructure capable of supporting the growth of economic activity. One of the infrastructure that needs to be considered is the inter-regional connectivity. This infrastructure will push down the cost of transportation and logistics costs in order to improve product competitiveness and accelerate economic mobility. In this case Jatinangor be one small town to determining the success of economic corridors.
2. The successful establishment of the function of each corridor bounded set not only on the magnitude of the city, because in fact the role of a small town can highly influence the economy in every corridor that has been established with the development of the creative economy and small industry.
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THE POSSIBILITY IN ENHANCING THE ROLE OF MOBILE TECHNOLOGY FOR BETTER PLANNING MANAGEMENT AFTER CIVIC CENTER RELOCATION

The Case Study of Governmental Employees of Kabupaten Sukabumi, West Java

Ridwan SUTRIADI, Anisa Nuriza P. dan Astri Aulia S.

Abstract

Sukabumi Regency, particularly Palabuhanratu district is determined as Pusat Kegiatan Wilayah (PKW), and the Pusat Kegiatan Nasional-Provinsi (PKNp) which means revitalization and acceleration phases of new development. Since the movement capital city of Sukabumi Regency to Palabuhanratu, the governmental activities will boost the development of Palabuhanratu district itself. On the other hand, ICT application (Information and Communication Technologies) in various fields, such as governance, economic and other tend to grow faster than before. The application of ICT, such as telephone, hand phone, fax, and internet means a lot to support the development of the district, also government plan in PKW and PKNp development. Since governmental employees as main component in governmental activities, therefore this paper aims to analyze possibility of governmental employees who work in Palabuhanratu apply ICT, especially to support governance daily activities process also private activities. The methodology used in this paper is quantitative research by giving questionnaire to the governmental employees who work in Palabuhanratu district. The result shows that governmental employees has been able to use ICT to work and personal purposes and have a positive relationship.

Keywords: ICT, governmental employees, working, positive relationship

1. Introduction

In order to accommodate the dynamics of the rapid development of the region, the government is currently doing some various actions related to the development or expansion of local government, such as providing regional autonomy, giving incentives/disincentives to the regional autonomy, and other various efforts to support the development of the region. Potential areas with sufficient natural and human resources contributed for both micro and macro development.

The rapid development in Sukabumi Regency provides opportunities for the development of a larger area around it. It is also supported by the determination of Sukabumi, especially District Palabuhanratu as Pusat Kegiatan Nasional-Provinsi (PKNp) and also as Pusat Kegiatan Wilayah (PKW), which is regulated in the Peraturan Daerah Kabupaten Sukabumi No. 22 Tahun 2012 Tentang Rencana Tata

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Ruang Wilayah Kabupaten Sukabumi Tahun 2012-2032. The PKNp Palabuhanratu has a main function as the central marine business with national and international service scale and supporting the development Ocean Fishing Port region and Minneapolitan. The PKW of Palabuhanratu as a center South WP which serve 26 (twenty six) districts in the southern region and has the main functions as the the district of administration, tourism, and supporting functions as settlement areas, agriculture, trade and services, fisheries, and industry. Both of these functions play a major role in determining the basis for regional development policies, so the public welfare purpose can be achieved and the rapid change in society can be accommodated.

Related to government policy, in 1998 they issued the PP. 6 which determined the moving of the capital city of Sukabumi Residence to the south, precisely in the District Palabuhanratu. The purpose of moving capital city to south of Sukabumi is to improve the development of south Sukabumi. As the district with the biggest area among other districts in Java and Bali, Sukabumi District requires a center that can serve the entire range of its service district. With the issuance of this regulation, the activity of government will automatically begin to be moved to a new location.

Various government facilities, such as offices, including all activities related to the administration and the public services gradually have been moved into Palabuhanratu District from several places in the regency and the city of Sukabumi. This affects government employees in terms of their long work trip. Before the government offices have been moved, they do the work activity and other activities at their old office, where the majority location were in Sukabumi City and surrounding areas. However, the decision of moving the office in which they work change the movement of work, adjust the distance of the new office location. The movements of the government employees to work at the new location has led to the changing patterns of movement from Sukabumi City to Sukabumi Regency, especially to Palabuhanratu as the capital district. They conduct the commuting to get to the work place. This activities affected to the success or failure of government because government employees activities will affect the overall system of government. If government officials do their jobs well, the systematic administration of activities will go well too. In other words, the government relied on the activities of Human Resources (HR) and activities in the system.

Related to recent regional development, government and private sector is developing the innovation to accommodate the more efficient activities by using a system of Information and Communication Technology (ICT). Giuliano (1998) said that the ICT can change the structure of the workplace and the organization of a job. ICT factors described here could be interpreted as something that could stimulate the growth of the service sector and integration of control systems with better price. This affects the pattern of movement of workers, due to the ICT can reduce spatial movement (Giuliano, 1998). A study in Los Angeles by Giuliano (1998) prove the shift in urban form as a result of the ICT progress. The categories of workers who had influenced or group that has a big hand in reducing the spatial movement is
contingent worker. Contingent worker is the kind of work that does not have a permanent job ties to an organization or self-employed work. Besides cases that occurred in the Los Angeles, there are also some studies that show opportunities of ICT as a breakthrough to enhance the human resource which will be able to improve regional connectivity.

From the flattening about PKW policies, the moving of capital city, human resources of administration officials, and the advancement of ICT, a system that involves of these parts are clearly imaged. The system starts with a good human resource, in this case government officials, will lead to a good system, plus the presence of ICT helped them work will make the existing system of government would be easier to achieve the objectives the determination of Sukabumi regency, especially District Palabuhanratu, as PKNp and PKW which previously planned. Based on this issues, this paper aims to analyze the human resources that exist in government officials in dealing with the advancement of information and communication technologies, especially in order to support the activities of government and private activities undertaken by the government officials.

![Figure 1. Area of Study](source: Local Planning Agency of Sukabumi Regency, 2011)

This paper took the observation in District Palabuhanratu and the location of new offices, which has been being the location of the seat of government in the Sukabumi
Regency. The discussion of this study is the mobility of government officials who work in the government office or regional organization (WTO) which has been moved from the Sukabumi City to Palabuhanratu. Methodology used in this paper is quantitative research by giving questionnaire to the governmental employees who work in Palabuhanratu district.

2. Information and Communication Technologies (ICT) and Practices of The Countries Using ICT on Governmental Activities

There are some definition of ICT, Jumira (2009) define that ICT is an umbrella term that covers all advanced technologies in collection, storage and dissemination of information. ICTs are one of several major, new technologies present in our social, economic and political systems. GSMA (2013) explain that city administrations across the world are looking to harness information and communications technologies (ICT), including mobile connectivity, to help address the many challenges of urbanization. ICT also can be used to improve citizens’ quality of life, make public services more efficient, etc. (GSMA, 2013).

Some of the countries in the world has been use ICT as a tool to improve all aspects of their country. For instance, the development of ICT industry in Korea has played a vital role in the spread of "venture businesses" based on new technologies (Hwang, et al., 2004). In Peru, ICT has a big role at the government system. Peru has already developed a Global IT strategy but it is not yet officially formalized and implemented. Peru also updated governmental institutions with institutional web sites and a single information portal to citizens. In Vietnam, their government use ICT for transferring knowledge to senior officials concerned with the expansion of telecommunications service to rural areas (Bertolini et al., 2002). Uganda, has ICTs potential contributions, because they had program named Personal Management Information System (under Governance and Public Administration Reform: GPAR). They are also support to ICT Policy Reform and setting up of UCC (Uganda Communications Commission)ICTs for government and administration of Uganda: support for government-internal use of LANs, WWW and Email (Bertolini et al., 2002).

Backus (2001) in Rao’s (2009) research about Role of ICTs in India Rural Communities said that ICTs aid to facilitate speedy, transparent, accountable, efficient and effective interaction between public, citizens, business and other agencies; promote better administration and business environment, and saves money in costs of transactions in government operations. The type of ICT, such as telephone, hand phone, fax, and internet means a lot to support the development of the district.

Hwang, et al. (2004) said that worker participation plays a key role in measuring decent work as worker participation enables the sharing of information on working conditions and the rights of workers and also enables workers to express their opinions and make decisions at their discretion, thereby playing a vital role in social dialogue. In this case, governmental employees as a worker that has role to share information to another office have to be good to run some software and sufficient to applicate gadget or another technologies. However, human resources, especially governmental employees in this case, have to be balanced the work and their family life, especially in ICT application.
Innstrand (2009) said that scholars have broadened the focus and started to examine how involvement in one role positively influences the other role. Work can have an independent, positive influence on family life, and family life can have an independent, positive influence on work life (Grzywacz & Marks, 2000 in Innstrand, 2009). Researchers have begun to recognize the positive aspects of the interaction, as recent studies have found work-home facilitation to be related to favorable outcomes like improved well-being, affective commitment, less depression and turnover intentions, motivation and productivity (Allis & O’Driscoll, 2008; Hammer et al., 2005; Hill, et al., 2007; Wayne, Randel, & Stevens, 2006 in Innstrand, 2009). Those statements show that work and family life has relation, whether it is positive or negative relation. This relation also related in the use of ICT. ICT could make work and family life become negative or positive relations. While the congruence model suggests that since work and family share a common cause, they can have either a positive or negative correlation and that any relationship found between the two is spurious (Esson, 2004).

3. Profile of Sukabumi Regency and Palabuhanratu District

Sukabumi Regency is located in the southern of West Java province within 120 km from the State Capital City, and 95 km from the capital of West Java Province. The total area of Sukabumi Regency is 4160.75 km². Sukabumi is the widest regency in Java and Bali. In 2010, the population of Sukabumi Regency ranks 5th largest in West Java, as many as 2,339,348 people, with a population density of 562 people per km² and sex ratio of 103.80. The population growth rate is 1.22% in 2009.

The geological potential of Sukabumi Regency, according to Kabupaten Sukabumi Dalam Angka 2010 data, the resources that have been used are geothermal resource at Gunung Salak and Cisolok, mining and minerals such as gold, silver, coal, quartz, marble, iron sand, bentonite, patio, limestone, clay, etc. Economically, the Gross Regional Income Sukabumi largely contributed from agriculture amounted 31.38%, and a second income contributed from trade, hotel and restaurant at 23.49%.

In governance and politics, the capital of Sukabumi Regency have been relocated. The relocating the capital occur after the PP NO. 6, 1998 about ‘Pemindahan Ibukota Kabupaten Daerah Tingkat II Sukabumi Dari Wilayah Kotamadya Daerah Tingkat II Sukabumi Ke Kota Pelabuhan Ratu Di Wilayah Kecamatan Pelabuhan Ratu’ had been issued. By the regulation, the activities of government which was originally located in Sukabumi City moved to Pelabuhanratu.

Pelabuhan Ratu districts have distance about 115 km from Jakarta, State Capital City, and 159 km from Bandung, the capital city of the Province. According to BPS (2011), from 8 villages in Palabuhanratu District, there are 2 villages are classified as rural town, those are Palabuhanratu Village and Citarik Village. One of them is Palabuhanratu Village, which is also administrative center in the village. The village Citarik and Citepus famous for its beach attractions. With an area of 10459.75 Ha district, sub district Palabuhanratu is enough wide the south of Sukabumi regency.
4. Analysis for ICT Application

Analysis was performed based on primary and secondary data. Primary data obtained from giving questionnaires to government employees working in an office in District Palabuhanratu, and interviews with informants who experienced the process of moving the Capital City, so they can transfer historical information. Secondary data obtained from BPS, in the form of statistical data related to information and communication technology.

In accordance with Sukabumi Government Regulation No. 22 Year 2012 on Spatial Planning Sukabumi Year 2012-2032 (Rencana Tata Ruang Wilayah Kabupaten Sukabumi Tahun 2012-2032), the government has a long-term plan for Networked Systems Regional Infrastructure (Sistem Jaringan Prasarana Wilayah) development in the form of fixed line communications network systems and the development of mobile networks to support good communication between regions and within regions of Sukabumi. For the fixed network, the government must provide the development of the local fixed network; development of fixed line long distance; development of fixed line international direct dialing; closed fixed network development, and improvement and development of network coverage throughout the district.

For the development of mobile network covering terrestrial cable network development; development of wireless networks (cellular); Development BTS
towers, and the development of the satellite network. Of all Palabuhanratu districts, Palabuhanratu village is the village with high telephone subscribers, i.e. 1,599 units installed home telephone there. The Palabuhanratu village is the location where the new office was established. This suggests that efforts to develop telecommunications facilities have started to run, and the first customers started from various government agencies started using the facility for work.

In addition, Sukabumi Dishubkominfo routine to do cellular towers inventory. From the results of the inventory, the number of towers that have been recorded around the 457 point spread in 47 districts. The tower owner, Indosat, Telkomsel, TBG, Protelindo, XL, Mitratel, AXIS, Towerindo, and other providers. This data collection related to availability of existing space and retributions for cell tower construction. Many of the villages in the Sukabumi Residence consist of 192 villages already have BTS tower, with the signal strength distribution of cellular phones 'Strong' which includes 293 villages, 'Weak' includes 72 villages, and 'No Signal' only 2 villages.

Sukabumi Dishubkominfo also has Dissemination Division of the Public Information and Communications which has the main task to implement some functions of Communication and Information Technology in the field of dissemination of information and public communication. To perform basic tasks as intended, Information Dissemination Section and Public Communications has the function of planning and working program of the Information Dissemination Section of Public Communications; data collection and processing in Dissemination of Information and Public Communication; preparation of study materials of technical policy in Dissemination of Information and Communication Public; implementation of human resource development of the Dissemination of Information and Public Communication; implementation of application development of Dissemination of Information and Public Communication; implementation of institutional partnership of government communication, social, and institutional communication profession; implementation of information dissemination and public communication via media; recommendations of institutional permits the Dissemination of Information and Public Communications; guidance, supervision and control of the Dissemination of Public Information and Communication; coordination and cooperation of its duties; monitoring and performance evaluation, and reporting the results of the tasks execution. The Dissemination of Information and Public Communication Division at Dishubkominfo indirectly supports the communication among OPD and raises the data transfer among OPD because there are implementation of human resource development of institutional partnerships and dissemination of information and communications application.

The Results from the interviews the informant and questionnaires proved that the application of information and communication technology basically has been used a lot in work or in daily life of government employees. Types of information and communication technologies (ICTs) used are varies according to the job duties and responsibilities of each position. The application of ICTs, especially mobile phones, has been being used by government employees. The mobile phone is used for
working and also the other purpose (personal use). With these functions, according to the theory mentioned earlier, the application may be positive in the sense of mutual support, or negative in the sense of a balance. In this case, a positive relationship occurs due to technological advances is used for working or for personal use, and there is no harm one another both from work or personal activities. Results of interviews with informants also mentioned, that the communication between government agencies, are now starting to use the internet system. They use the internet facility to transmit data and critical information among employees and agencies. With the existence of a positive relationship between personal and work activities, then indirectly governmental activities will take place well, because the components in it like a government employees are able to apply advances technology and compete with other regions. On the other hand, with this capability of government employees to use ICT among institutions, will lead to further developments, such as the use of ICT for communication with the public. If it can be maintained and developed, in the future, PKNp and PKW goals would be easier to be realized.

5. Conclusions

This paper underscores applicability of governmental employees to support governance daily activities process also private activities by using ICT. By considering positive relationship between governance daily activities process and private activities, a more complete picture of the PKW and PKNp goals would happen in a short time. In general, the findings indicate that it is important to know how the governmental employees as the main element of government part to applicator ICT. Moreover, individual governmental employees and the organization where they worked should update the fast growing of ICT and maintain capability of human resources. The paper also shows the relevance of human resources (governmental employees) in studies of ICT. As long as ICT shows to help development, to have positive relationship between work and family on ICT application is the important thing.

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TRANSPORT INFRASTRUCTURE AND TOURISM PRECINCTS:
KEMANG, JAKARTA CASE

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Abstract

This paper examines the problems and issues, and assesses the extent to which transport infrastructure can be resolved in tourism precincts. Specific problems that build up over time and demand action include traffic congestion and parking, visual intrusion, danger, vibration and atmospheric pollution that cause damage to the tourists’ attractions in tourism precincts, as well as to the health and safety of those on foot or using non-motorized transport. Context in tourism precincts is as important as the individual tourist attractions themselves, and an important contributing factor will be the infrastructure, provision and network of transport. Appropriate planning and management of transport—including walking—is required to ensure that Jakarta tourism precincts continues to function and prosper as a living place. Without such intervention, there is a very real danger that the denseness and flow of tourists and visitors will conflict with the day-to-day activities and movement of local people. The paper concludes that in planning and managing the transport needs of visitors in tourism precinct the areas need to be addressed include: Make certain that transport strategies are integrated and the various transport systems are compatible and coordinated; Ensure that information on transport is clearly relayed to visitors; Promote alternative means of transport to reduce pressures and develop links between conventional and non conventional means of transport; Recognize that open spaces, car parks, pedestrian zones, the areas “in-between” are all part of the tourism precinct city and any intervention in the urban realm must enhance rather than detract from the character of the tourism precinct environment; Address local needs first: transport solutions that serve local needs will provide an infrastructure from which successful tourist services can be developed.

Keywords: Transport, tourism precinct, planning, urban design, innovative solution.

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1. Introduction

While some tourism precincts have become well-established and popular destinations, others have emerging and fast-developing visitor economies. Urban cultural heritage is now widely appreciated as an economic and social asset. Urban authorities are thus deliberately nurturing high yield cultural tourism based on city’s heritage and the arts, especially where older industries have declined or relocated (Evans 2001). Some may be promoted as “cultural quarters” with venues for live performances, museums and art galleries, and may include “must see” or “flagship” attractions. Typically, there will also be a range of small and medium-sized businesses, some of which are oriented towards local needs, as well as smaller attractions and facilities concerned with place-history and contemporary arts that attract local and specialist audiences.

In many cases, considerable commitment and resources will be required to create the basic tourist infrastructure and facilities that are required, but this is seen as an investment that will help regenerate the local economy. Public funding may be invested to make the area accessible, safe and visually appealing to visitors, including international tourists. Residents may benefit if this results in improvements to local transport, community facilities and the public realm that they use on a day-to-day basis, as well as from the expenditure of visitors if this increases local income and creates attractive, well-paid jobs that residents are able to take up. Within an appropriate planning framework, inward investment may help fund conservation of the built heritage and public spaces, enhancing the environment for urban communities. Less tangibly, the interest of outsiders may also foster a sense of confidence and civic pride: a significant benefit in poorer areas where low self-esteem has been reinforced by the negative perceptions of outsiders (Shaw 2003).

The arrival of visitors by car or tour bus, may nevertheless have an impact that is far from positive in tourism precincts whose built form was developed in pre-industrial times for more traditional forms of transport. The streets of these great cities designed for pedestrian movement are unsuitable for most wheeled vehicles. Narrow streets, tight corners and steep hills that make up tourism precincts are a challenge to motorized traffic and the presence of vehicles can restrict safe pedestrian movement. Large service vehicles trying to negotiate narrow junctions frequently damage the tourism precinct fabric.

Nevertheless, the majority of visitors who want to experience the atmosphere of tourism precinct cities arrive by private car, and in developed countries such as the U.K. this rises to over 70% in small to medium-sized tourism precincts such as Durham, Cambridge and Canterbury (English Tourism precinct Towns Forum 1994). The provision of sufficient, appropriate and accessible car parking space, especially off-street, thus remains a major priority for cities that want to develop as a tourism destination. The highest visitor spend in tourism precincts is from visitors staying overnight, and when they stay in the centre of cities they are more likely to patronize local establishments and spend longer wandering around shops. However, public provision for a highly seasonal influx of car-borne visitors close to the tourism
precincts is an important issue for land use allocation, and a delicate balance has to be struck with local demand. Parking restrictions in central areas thus make larger and often chain hotels on the periphery with car parks more attractive to visitors arriving by car.

Car parking has become a significant problem and issue for urban authorities in tourism precincts throughout the world. Not only is there limited available space in which to park cars, once parked they are often an unwelcome visual intrusion to the unique qualities that make tourism precincts so appealing to visitors. While underground car parks are visually less intrusive, they may well destroy the visual of heritage buildings, and multistory car parks rarely sit comfortably in a low rise and small-scale urban environment. Limited parking, compounded by blanket pedestrian schemes, also becomes a deterrent for residents living in tourism precinct centers. Madrid is just one example where residents are moving out of the tourism precinct centre as parking problems are escalating. Yet, it is the life in cities that is one of the attractions for visitors and also what stops them from being “dead” tourist places.

Second only to cars are visitors arriving by coach, and coaches parking up against a major monument or in the context of an tourism precinct city can be unsightly. Coaches provide a more efficient means of transporting large numbers of visitors than cars, but with no place to park, their drivers may have no option but to start circling while their group visits the attraction. This not only adds to traffic congestion, but also increases pollution levels. In many European cities, for example, coaches circling while groups visit one building have, for several decades, had a major impact on traffic levels as well as on air quality in the City. In the early 1990s, Salzburg was inundated with up to 600 coaches a day, including many from Eastern Europe, whose passengers seldom spent more than two hours in the city. The coaches were generally old, noisy and emitted excessive fumes. In response to public pressure, the city council prohibited coaches from entering the centre without proof of overnight accommodation or restaurant booking, but these restrictions proved unpopular as local businesses suffered from a greater than anticipated fall in coach numbers (English Tourism precinct Towns Forum 1999).

Urban authorities throughout Europe are experiencing the problems of tourism precinct cultural quarters that have become “victims of their own success,” including the problems of excess demand over capacity. Large visitor flows put pressure on infrastructure, and can be detrimental to environment and amenity, especially if they arrive by private car or tour-coach. Even predominantly pedestrian cities like Venice become congested at peak periods. The presence of tourists may cause local people to avoid some areas altogether or reschedule their daily activities (Shaw & MacLeod 2000). In such circumstances, local people may feel alienated, as tourism-related development and commercial activities constrain them from enjoying the public realm of their own city (Goodey 1994), at times isolating tourism precinct centers into tourist enclaves (Bianchini & Schwengel 1991).
In time, tourists and the industry that caters for their requirements, may overwhelm and dominate the tourism precinct urban landscape to such an extent that it destroys the very qualities that the visitors found appealing in the first place. Rising land values may displace established local residents and small businesses that contribute to the neighborhood’s distinctive qualities. The success of tourism in tourism precincts and urban areas is dependent on planning strategy approaches and the sensitive management of visitors in complex urban situations, both physical and social. Transport issues are closely linked to both planning and management, from how visitors arrive at a destination to their movement within them.

2. Planning for tourism and transport in tourism precincts

The development of tourism precincts is, to some extent, supply-driven with the availability of transport routes and services exerting a strong influence on the volume and type of tourism demand in particular places at particular times. From the visitor’s point of view, transport is part of the experience from choice of transport to travel to a tourism precinct city destination, to the point of arrival and movement within the tourism precinct area. Transport and land use planning by urban authorities, and the commercial policies and practices of transport operators, both play an important role in determining the quality of the “experience” for visitors. Ideally, provision for tourism should be complementary, but in many cases, conflicts occur between provision for the movement of visitors and local demand.

Getting there

The significance of supply-driven tourism in tourism precincts has been powerfully demonstrated by the promotion of short breaks to family and independent travellers. This has opened up heritage tourism to lesser-known and hitherto “unspoilt” destinations; it has contributed to the dynamism of cities such as Jakarta and Bandung; but it has also added to the pressures on popular destinations such as Jogja and Solo that already faced capacity problems. The capacity and quality of trunk roads and the orientation of routes can also play a significant part in determining the pattern of tourism where fast roads connect tourism precincts directly with major population centres or with airports and holiday resorts. However, easy access also signals quick departure. Good road connections have made the Jakarta, and particularly Kemang, a popular day trip destination for foreigners and expatriates visiting Jakarta, causing significant congestion and strain on local infrastructure with little contribution to the local economy.

How visitors reach a destination is an important consideration in both the marketing of places and also in the facilities that have to be provided and where links and interpretation has to be developed. Given the high dependence on cars and coaches, urban authorities must address the need for effective strategies for parking and onward movement of large flows of visitors that are appropriate both to the pattern of demand and the nature of local conditions, especially the capacity of the road and public transport system, the mix of land uses, and the availability as well as the suitability of sites for parking. Despite the predominance of the private car and tour
bus, however, other more sustainable forms of transport should be promoted in the interest of both the city as destination and the region as a whole.

Arrival

When the railways came in the nineteenth century, most stations were located on the outskirts of what were then the existing urban centers. Airports, introduced in the twentieth century were located even further away. Consequently, the arrival points for many domestic and international visitors to tourism precincts may be at a considerable distance from the heritage attractions or tourist accommodation. The railway operators of the late nineteenth and early twentieth century left a legacy of grand and imposing termini, which in cities such as Bandung, Jogja and Solo provide arrival points that are heritage attractions in their own right.

There are also some fine examples of well-designed modern “gateways,” where tourism has justified new facilities that also benefit local residents and businesses, such as the new airports and rail links built for the Olympics venue. Some new high-speed rail terminals also provide impressive gateways. Unfortunately in many Indonesian cities, however, there are many other transport interchanges—airports, ferry ports, railway and coach stations—that are less well designed, maintained and managed, which provide a cold welcome and inconvenience visitors with poor onward connections.

To encourage people, especially first-time visitors unfamiliar with the city to use local public transport systems and/or walk to reach tourism precinct city destinations, it is important to provide good links between the point of arrival and the destination area. This will not only be in frequent and reliable transport, and adequate sign posting in pictograms or in a number of languages, but also in determining desirable and attractive routes. For example, visitors arriving with certain expectations of “tourism precinct” will not want to walk from a railway or coach station through a run down or industrial and unwelcoming part of town to reach their destination. In Singapore, a scheme of maps, signposting and dedicated routes connects railway station with the old docks area, which is being developed as a leisure and activity hub.

The provision of a coach park needs to be combined with a drop off and pick up point close to a major attraction or central area in a tourism precinct. This is particularly important as coach visitors are likely to be older people or school groups, and in some cases parents with young children. There will be a need for integrated planning for tourism development and promotion as to how much coach tourism is to be encouraged and how it will be managed. Where land is available and compatible with neighboring uses, coach parks and rest facilities for drivers may be sited in peripheral locations where they will not obstruct local traffic and have good access to trunk roads.
For most visitors the car park is the point of arrival, a first impression and a point of orientation. Facilities such as toilets, information points, and orientation in car parks are important components of welcoming visitors to a location. Park + Ride schemes can be developed, inviting visitors to use car parks on the outskirts of a city and catch a regular shuttle bus into the centre. But, even when car parks are located on the periphery, provision needs to be made for disabled parking in a central location. In tourism precinct city centers a delicate balance has to be achieved between providing sufficient parking space without detracting from the unique character of the place. Furthermore, visitor parking must not impact on residents’ parking.

**Travelling around**

Most cities have a wide range of activities to offer, some of which might be spread over a large area not always navigable on foot. Alongside a tourism precinct core there might be an attractive riverside or another leisure activity; or the tourism precinct core might be located on a steep hill. Despite the desirability of encouraging alternative means of transport, private cars and tour buses, with their door-to-door convenience, remain highly attractive and convenient modes of transport for visitors, especially if their time to explore is limited. In contrast, local public transport is often perceived as a poor and inconvenient alternative for travel within tourism precinct.

One solution is to develop scheduled services dedicated to visitor travel, if such special-purpose transport is commercially viable. Examples include hop-on hop-off buses in cities such as London, Barcelona and Dublin. These can also offer visitor information, guided commentaries and even discounts to attractions. They provide useful orientation for first-time visitors, and those with open top decks offer particular opportunities to view famous landmarks and take photographs. Compared with tour-buses, they offer greater flexibility to their passengers as well as a practical way of moving large numbers of visitors between sites without the associated parking and circling problems. Nevertheless, they may sometimes be seen as visually intrusive, especially in smaller tourism precincts. Residents in many tourists’ cities in Europe have campaigned vigorously against the sightseeing buses, including drenching passengers on open-top buses with their garden hoses. On the grounds that they were both visually disruptive and impacting on the tourism precinct road surface, buses are no longer permitted on the famous tourism precincts.

Underground and metropolitan railways (metros) penetrate to the heart of major cities, providing access for large numbers of visitors as well as local people without congesting the streets on the surface. In contrast to small and medium-sized tourism precincts, where arrivals by car and coach predominate, metro stations can provide the main means of visitor access to tourism precincts described below.

From a visitor’s point of view, urban public transport should offer a well-integrated city-wide system, i.e. a coordinated network of connecting modes (e.g. local rail, bus, tram) and services (routes). Key features would include the following (Shaw 1993):
• Interchanges designed to provide access for people with special needs and minimize walking distance, suitable waiting facilities, sense of personal security, signage and passenger information that is intelligible in different languages, staff available to provide information with language skills;

• Schedules that are reliable and which minimize waiting time for passengers changing mode/service;

• Through ticketing that is easy to purchase and use on different services and modes of public transport;

• Service information available off-system, including Websites that offer prospective visitors passenger information to plan their journey and perhaps to book in advance on-line from home.

Unfortunately, however, many public transport systems fall short of this ideal. Incremental and piecemeal development, interchanges inherited from earlier phases of development and the physical configuration of sites may make it difficult or impossible to upgrade. Services are likely to be less frequent between peaks and at weekends when visitors are most likely to use them. Some tourism precincts have, nevertheless, developed well-integrated and tourist friendly public transport. Some tourism precincts of European countries such as Prague, Czech Republic and Cracow, Poland have relatively good public transport systems with modern vehicles and well-maintained infrastructure. These have considerable potential to carry international tourists sustainably and bring additional revenue to their municipal operators, but service information and ticket-outlets make little concession to those who speak other languages.

3. Innovative solutions

The use of other forms of transportation could become an added attraction. In some places there is the opportunity to make better use of waterways for example. This form of transport might have novelty value but can also be very effective as a means of transport and in reducing pressures. While the water ways are the main form of transport in many cities in Indonesia, such as Palembang, Banjarmasin, river and canal transport is predominantly a tourist attraction. River transport system may be integrated with the city-wide system of public transport and links cultural and heritage attractions along the river. The drivers may carry free guidebooks and an information system shows passengers where they are on the route and images of the attractions at the nearest stop. To serve the needs of residents and employees as well as visitors to the capital, the vehicles are designed to be accessible for people with physical disabilities, those with small children or encumbered with heavy luggage or shopping.

Although a relatively small percentage of visitors arrive by this mode, cycling holidays are increasingly popular throughout many cities in Europe, and some urban
authorities are improving facilities. For example, a franchise-operated bike park, five minutes’ walk from the city centre, provides secure lockers for cycles and clothes, showers and bicycle repairs. Opportunities for rental and easy to follow maps will promote cycling and reduce pressures on other forms of transport, where urban routes for cyclists are well segregated from motorized traffic. Cycle routes in tourism precinct centers must, however, respect designated pedestrian environments. Other alternative and novel forms of transport include low impact road “trains,” people movers, pedal-rickshaws. Horse carriages are popularly used in cities such as Jogja as an added visitor attraction and alternative tour of the city in summer months.

Pedestrian zones

Pedestrian areas are a solution to providing safe pedestrian access in tourism precincts as well as reducing the visual and physical impact of cars. The “spaces in-between” are as much a part of the tourism product as are the heritage attractions, retail outlets and hospitality businesses. This network of public spaces provides a web of connections that offers people a range of choices when deciding to make local journeys in the course of their daily lives. Safe, well maintained, attractive and uncluttered open spaces play a crucial role in strengthening communities.

In tourism management there is a very important link between good urban design and transport planning which is often overlooked. The nature, materials and design of pedestrian areas not only help define what is known as the public realm and but can also enhance the character of a tourism precinct area. In the broad context of an urban renaissance founded on design excellence, social well-being and environmental responsibility, an Urban Design Task Force may be established to design and report highlights some examples of imaginative strategic planning where high quality urban design as enabled tourism precinct to be well connected with modern development. Cities such as Amsterdam, Barcelona or Copenhagen are cited as cities where comprehensive developments to improve pedestrian and cycle movement have been undertaken.

Nevertheless, by creating pedestrian-only areas, traffic problems can be moved to neighbouring areas or a distinct border zone created where shops and businesses immediately outside such a zone lose out on key business. The interface between pedestrian and traffic zones need not be “rigid,” so long as differences are clearly indicated for safety purposes, speed limitations set and surfaces differentiated. Schemes that integrate pedestrian and traffic in a clear scheme that provides sufficient access throughout the day and one that doesn’t create a large boundary area can also be successful. Other initiatives such as widening pavements or narrowing roads to make easier crossing points can be just as effective in combining desirable and active pedestrian areas with traffic management.

Links between the various activity areas in a city need to be made attractive, safe and accessible for the benefit of all. Overall, interventions need to remain in keeping with the character and local distinctiveness of the tourism precinct area. This does not mean the use of standard street furniture and fittings in “heritage” styles. Throughout
Europe for example, the population is an ageing one and considerations for their safety and easy accessibility in the urban environment is becoming a priority which is also reflected in recent legislation. This group represents a substantial tourism market segment for tourism precincts, and their needs cannot be overlooked when developing transport solutions and designing open spaces in cities. Some considerations include:

• Surfaces suitable for wheelchairs and others with mobility difficulties;

• Level paving but clear (visual and physical) differentiation between traffic and pedestrian areas;

• Provision for alternative means of transport in pedestrian areas.

The servicing needs of shops and businesses that serve the needs of local people and tourists must also be planned and managed sensitively, especially with regard to the routing and timing of deliveries to replenish retail stock and to service restaurants, bars, hotels and so on. The collection of refuse and other waste as well as street cleansing is also an important consideration as the vehicles are likely to impact both physically and visually on the tourism precinct environment, as well as on the daily lives of residents and other local users. Physical solutions include providing guidance on the paving to ensure that damage to the tourism precinct fabric is avoided and the use of quieter and short wheel-base vehicles with low emission levels. Signage is an important visitor management tool, but too many and visually conflicting signs regularly detract from the sought after qualities of a tourism precinct environment. Good traffic planning, the design of surfaces and choice of paving can significantly reduce the number of signs that are required. Bollards for example indicate that vehicular access is not permitted, and can reduce the need for a large “no access” sign.

4. Transport as a means of improving tourism potential

Solutions are necessary not only for tourism precincts which are already popular as tourist destinations, and which experience pressures due to large seasonal flows of visitors, but also for the less well known neighborhoods that have the potential to attract more visitors and may help relieve visitor pressure elsewhere. In such cases, there is scope to adopt a more pro-active approach where visitors are encouraged to travel by public transport and make use of walking and cycling routes.

The concept of the public realm, provides a useful starting point, especially to understand the quality and interconnection between urban public spaces, and the vision needed to make improvements. Nevertheless, it should be regarded as a key element within a more holistic framework of action to develop sustainable access. In sensitive areas, the need to minimize the intrusive effects of tourism on the daily lives of residents, as well as the tourism precinct built environment, may require the control of entry/parking for visitors’ cars and tour-coaches. Instead, convenient
access by rail/metro/rapid transit, bus and water transport — as well as for exploring safely on foot and by cycle — may be developed. Thus, visitors will be encouraged to share facilities used by local communities. The expenditure of tourists may help provide the rationale to upgrade and improve dilapidated infrastructure such as metro or bus stations, street lighting and paving of public spaces, and contribute to the upkeep of services which are also used by local people, especially public transport.

Where major new infrastructure is planned, there may be opportunities to influence the pattern of visitor flow and, in the longer term, change the tourism geography of a city by linking in the lesser-known, less-visited tourism precincts that can accommodate and benefit from the development of a local visitor economy. Examples include the extension of city’s resident public transport to the extension to the industrial/maritime heritage quarter.

5. Conclusion: Transport needs and tourism precincts

Cities are complex living places with conflicting demands on urban land use and enjoyment of the public realm. No two tourism precincts are the same, and transport solutions must respond to each individual place. Nevertheless, in planning and managing the transport needs of visitors in tourism precinct the following key areas need to be addressed:

- Make certain that transport strategies are integrated and the various transport systems are compatible and coordinated;

- Ensure that information on transport is clearly relayed to visitors;

- Promote alternative means of transport to reduce pressures and develop links between conventional and non-conventional means of transport;

- Recognize that open spaces, car parks, pedestrian zones, the areas “in-between” are all part of the tourism precinct city and any intervention in the urban realm must enhance rather than detract from the character of the tourism precinct environment;

- Address local needs first: transport solutions that serve local needs will provide an infrastructure from which successful tourist services can be developed.

An integrated approach is essential and an tourism precinct cannot be isolated from city-wide transport policies, or indeed regional transport planning. The ultimate aim of pedestrian and vehicular planning must be to create safe and accessible environments for residents, local workers and visitors alike.

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References


REFRAMING APPROACHES TO CONCEPTUALISING URBAN GOVERNANCE IN MELANESIA: INSIGHTS FROM JAYAPURA AND PORT MORESBY

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Abstract

Urban governance in developing countries still relies strongly upon the efforts of the government to resolve and manage urban issues that fall within the public domain. In terms of the provision of urban infrastructure, spatial plans and policies are the main tool of formal governance in delivering urban services and infrastructure as well as distributing the broader benefits of development. However, the implementation of these plans and polices has resulted in mixed outcomes as these countries face the symptoms of rapid urbanisation. In Melanesia, the largest Pacific sub-region in terms of land area and population, urbanisation has become permanent and contributed to the increased visibility in the rise of poverty and settlements. As governments struggle to increase the quality and coverage of urban services, the population demands on the provision of basic infrastructure has increased. As Governments try to meet basic public needs, people with least access to formal mechanisms for services and infrastructure have developed their own means to meet their needs by utilising their resources, social capital and kin network. Mainstream planning literature has often labeled such process, outcomes and consequences such as land allocation and housing development as illegal since they are not produced in the formal planning and development system. In the context of informal urbanism as the mode of urbanisation, this paper will explore the emergence of informal types of urban governance in the provision of urban infrastructure and other needs in Melanesia by comparing the situation in the mid-sized cities of Port Moresby and Jayapura. The paper will discuss the nature of self-organised provision of urban infrastructure and other basic needs which has been flourishing in both cities, plus the implications for moving towards more effective arrangements in urban governance and management.

Keywords: governance, informal settlements, Jayapura, Port Moresby.

1. Introduction

Growth in urban areas has been a major trend of urbanisation in the last 50 years, especially in developing countries. Importantly, urbanisation growth in the Asia region has contributed the largest proportion of urban populations in the context of overall world urbanisation trends (UN-WWAP, 2012). All evidence points towards regions comprising developing countries being the focus areas of urban growth in the

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next 30 years, with China, India and Indonesia identified as having the highest urban population growth rates during this period (UN-HABITAT, 2011).

As urbanisation generates both positive and negative impacts on urban society and the environment, rapid urban growth in developing countries invariably implies some form of adverse consequences. Urban segregation and exclusion, for example, will become more complex in terms of their social, economic and spatial dimensions (UN-HABITAT, 2011). It is also acknowledged that urban segregation and exclusion have been key drivers in producing urban informality (Roy, 2005; Watson, 2009), which it has been argued results from rapid urban growth which distributes the least benefit to the poorer population (Watson, 2009; AlSayyad 2004 in Devlin, 2010). One result of the above is that urban space is subsequently produced by part of the urban population who have little concern and interest with formal planning rules, and by implication are excluded from such rules and regulations (Hall and Pfeiffer, 2000 in Roy, 2005; Jones, 2011). Recent planning literature confirms that urban informality is now a major mode of urbanisation, reflecting insights into how the processes of urbanisation unfold and play out in towns and cities (Roy, 2005; Porter et al 2011), and as such, should not be seen as separate element of urban growth (Rukmana (2011) in Porter et al (2011)).

In the above context, this paper explores forms of urban governance emerging in the provision of urban services and infrastructure in Melanesia by comparing the situation in the mid-sized cities of Jayapura and Port Moresby. The paper identifies the nature of urban governance arrangements, particularly for infrastructure provision, which has been flourishing in both cities, as well as the implications for future arrangement in urban management. The paper discusses the nature of urban governance, the rationale behind varying arrangements, and the impacts of various governance arrangements on broader city building processes. The paper concludes by acknowledging the importance of research into exploring forms of informal governance arrangements as a key contributor to urban development.

2. The Nature of Urban Governance

This paper defines the scope of urban governance as governance that encompasses both formal and informal arrangements that impacts upon resource allocation, enabling access and facilitating development (Nunan and Devas, 2004) and which “...encompasses a multitude of stakeholders that includes various levels of government, nongovernment organizations (NGOs), the private sector, civil society, donor organizations, and community groups” (ADB, 2012 p. 61). The scope of urban governance comprises individual citizens and households of all groups, in as much as they have any influence over what happens in the urban domain (Nunan and Devas, 2004), thus delivering “... multiple social interactions through time, shaped by their histories, creatively adjusting to the flowing and changing context” (Healey et al, 2004 p.23). In the Pacific Region, urban governance has been viewed as a much broader concept than the government systems of urban administration, being terms misunderstood and misused (ADB, 2012). (see Box A).
As globalisation has accelerated, there has been increasing innovation in dealing with complexity of management challenges in developing countries. This has occurred at the state, regional, local and increasingly at the communal group and household level as mainstream types of governance, such as “authoritarian” and “hierarchical” approaches, have failed in delivering services and welfare as promised (Chan and Hu, 2004). On one hand, spatial plans and policies are claimed have a prominent role in managing these problems as they argue that they provide government the ability to intervene and support public interest, however defined (Friedmann, 1987 in David and Philip, 1998). The scope of public interest includes maximising the ‘distribution of wealth’ (David and Philip, 1998), ‘city management’ (You, 2007) and provision of infrastructure and services (Wahed, 2010). Thus, spatial plans and policies may assist the government to improve city welfare and prosperity. On the other hand, it is also admitted that traditional forms of public intervention has contributed in widening the social, economic and other ‘gaps’ amongst people and groups (Harloe, 1992; Watson, 2009). Groups with lower level of income remain neglected and not facilitated in the formal process of spatial plans and policies, thus accentuating the urban divide as rapid urbanisation proceeds and plays out in varying ways (UN-HABITAT, 2011).

Accentuation of the urban divide, however defined, tends to push the marginalised and those already disadvantaged into the realm of groups ‘informality’ especially in terms of accessing public infrastructure and services needed for their survival (Altrock, 201); Jones, 2012). In fact, ‘conflicts between the logic of governance and government and the logic of survival’ (Watson, 2009) - in other words, the disconnect between government plans and policies and implementation on the ground - has provided a window for these marginalised groups to mobilise themselves so as to fulfill their needs. What is increasingly clear is that urban development and the provision of public services and infrastructure is not merely the results of government intervention through formal processes, but also the result of a myriad of informal process in society (Nunan and Devas, 2004; Healey et al 2002).

Box A: Urban Governance in the Pacific Context

“It is thus not surprising that “urban governance” and “urban management” are terms neither well understood nor familiar to Pacific bureaucratic institutions or the public-at-large. Urban governance is the conduit by which residents and groups - including government - voice their concerns, exercise their legal rights, debate, resolve their differences, and fulfill their obligations. Urban governance thus encompasses a multitude of stakeholders that includes various levels of government, nongovernment organizations (NGOs), the private sector, civil society, donor organizations, and community groups.”

In the Pacific Region, it has been acknowledged that urban governance encompasses two parallel forms of urban governance that operate in tandem: (i) urban governance based on formal state systems supported by systems of public administration and bureaucracy, both necessary for achieving the development objectives of the formal government; and (ii) urban governance anchored on traditional practices and social hierarchies, which include structures that have their roots in social affinity and connections to family, place and landowning groups. Examples of traditional local governance mechanisms are village courts, the scale of political power afforded local leaders, and, more recently, the establishment of local committees in urban settlements and greater involvement of churches in local governance processes. The intersection of the formal and importantly informal governance systems in increasingly recognised as a critical component of city development (ADB, 2012).

In this context, increasing informal urbanism in respect of how urban governance plays out in many towns and cities in developing countries should be seen as an inseparable part of the urban development process. Instead of viewing this phenomenon as a deviation from formal mainstream planning, informal governance should be acknowledged as critical building block in facilitating ‘bottom up’ approaches which allows urban citizens to take part in decision making processes and arrangements which contributes to improving their urban quality of life. Therefore, a better understanding the nature of urban governance in varying city contexts is essential to understanding and conceptualising the process of city building and its wider social economic, environmental and political dimensions.

3. Case Studies
3.1 Jayapura, Papua, Indonesia

The urban population in Indonesia has increased significantly during the period 1980-2010, rising from 22% of the total Indonesian population in 1980 to approximately 49% in 2010 (Firman, 2012). The largest concentration of both populations and urbanised areas remains focused in Java Island (BPS) with other islands such as Kalimantan and Papua remain least populated. Consequently, Indonesia has to deal with several issues concern with balancing patterns of urbanisation, including adequacy of urban infrastructure and service provision, as well as problems related to imbalances in human development disparity.

Papua is the least developed province in Indonesia, remaining last ranked in the country in terms of the Human Development Index (HDI) (BPS, 2012). Also in regard to levels of poverty, Papua is also the poorest province of the country, with 32% classed as living in poverty in 2011 (BPS, 2012).

Policies to accelerate the development process in Papua have been carried out by the Indonesian government, including enacting Law 21 of 2001 concerning the ‘Special Autonomy for Papua’ (which includes both Papua Province and West Papua Province). According to Law 21, Papuans are prioritised to receive special rights such as priority in access to education, health, infrastructure, gender equality and
opportunities for community empowerment. Furthermore, a large number of territorial delineations have been put in place during the last decade, thus dividing the province from 11 counties and 2 cities in 2001, to 28 counties and 1 city in 2011 (BPS, 2012). This policy as contained in Law 21 has contributed to an accelerated urbanisation process as towns were designated as focus areas for urban growth and development.

The capital city of Papua Province, Jayapura, started to grow significantly after the city was enacted as an autonomous administrative area in 1993 (Kambu, et al 2009). Unlike Java Island and other growth centres which have experienced declining urban growth, Jayapura maintains the largest proportion of urban population in Papua, with a total population of 236,476 persons in 2010 (BPS, 2012b). Jayapura also has the highest growth rate of population in Papua Province, approximating 4.4% annual growth (BPS, 2012). Furthermore, in terms of spatial development, Jayapura is the most urbanised in the province with approximately 97.68% of its population living in the defined urban area.

Jayapura was modeled on the Dutch planning approach during period of the early 1900s to the period approximating World War I (Kambu et al. 2009; Siagian, 1978). The first modern settlement was built in 1909 by the Dutch Government initially for military use. In the World War II period, the Dutch Government put in additional infrastructure, services and education to support their military purposes and administration systems. Under Indonesian government during the period of the New Order Government 1962-1998, this region began to experience increasing disparity especially in regard human and spatial development.

The formal planning system in Jayapura comprises two major planning mechanisms, namely, spatial planning and development planning. Both forms of planning have different scope and spatial application at the national, provincial and local level as well as application across differing time periods. The arrangement of spatial plans, including their preparation, implementation and evaluation is based on Law 26 of 2007, namely, “Spatial Management” in which all types of should comply with. The unconformity of spatial plans and policies will result in legal and administrative consequences. Citizens’ engagement in the preparation of formal spatial plans arrangement is regulated by Government Regulation 68 of 2000. In contrast to spatial plans, development plans contain policies and actions of government in providing infrastructure and other public services in the short, medium and long term in which government is the main stakeholder. The procedures and process of preparation, implementation and evaluation of development plans, including the community engagement are based on Law 25 of 2004 concerning “Development Planning” which falls under the ambit of the Planning Boards at all levels. Both spatial and development plans have their own evaluation mechanisms. The evaluation of spatial plans, often called spatial plan “review”, is conducted at least every 5 years during implementation (Art 25 Law 26 of 2007). Development plans, in contrast, have an annual evaluation process which is conducted by the Planning Boards, Supervisory Boards and Treasury Board.
In Jayapura, spatial plans and policies have not been implemented effectively. Due to resource limitations and other factors, the City Government has identified only a limited number of priorities for development, plus specific city locations, for public service and infrastructure development\(^3\). Consequently, Jayapura has continued to experience a trend that has been named ‘spontaneous settlements’ (Scargill, 1979), namely, the ‘illegal occupation’ of private or state land (including slums) in several parts of the city. The polarisation of a limited number of spatial plans and policies being applied to a select few areas, rather than citywide, has accelerated the urban divide however defined. One consequence of the above is that those most affected by the skewed development and implementation of the spatial plans and policies are the urban poor who develop their own ways to meet their community and household needs.

In Jayapura, it is estimated some 25% of the population, namely, approximately 60,000 persons, lives in informal or unplanned settlements\(^4\). The informal settlements in Jayapura have emerged by taking up urban space within, between and contiguous to the planned areas of the city. This includes settlements which sprawl out from the fringe areas of the city. In all these areas, informal settlers occupy land without formal or legal permits from the owners or the government. On undeveloped land in the planned areas, settlers build shelters and kiosks in public spaces, such as parks, waterways, and on vacant land. The buildings and development use invariably do not comply with city planning and building regulations, often being developed on lands classed as marginal under the formal planning system. This includes steep and hilly areas (including power easements) or other area prohibited for urban development according to the spatial plan.

Lands are illegally developed for settlement not only by migrants from other parts of Papua or wider Indonesia, but also investors large and small who build modern housing and commercial buildings in such locations. Since these settlements are considered illegal under the formal planning system, the issue of land titles and access to formal public infrastructure and services is constrained, thus development occurs in an ad hoc manner. As spatial plans recognise these areas by identifying them as unplanned, development plans mark such areas as ‘least priority’ in terms of the provision of urban infrastructure and services, including roads, drainage, water, sanitation and electricity.

\(^3\) Regarding development plans, analysis on mid-term development plans for the period 2008-2012 shows that city government has put priorities regarding development sectors and location. Major sectors are infrastructure (34%), general sector (23%) and education (18%), while health and economy sectors share the least. District Abepura and Muara Tami have been the main locations for development as with total 288 and 235 projects respectively in the last five years, while District Heram has the least number of development projects in the same period.

\(^4\) Estimate by authors based on overlapping aerial maps of existing settlements and Jayapura City Plan 2008.
Informal settlements in Jayapura can be classified into several groups according to their location, types of resident and housing quality. In terms of location, informal settlements are located in two major areas, namely, the urban centres and the urban fringe. Informal settlements in and adjoining the built up urban centres take up public lands such as parks, roadside reserves, pedestrian paths, river floodplains, and coastal area in urbanised districts such as North Jayapura, South Jayapura, Abepura, and Heram. Settler groups have encroached onto formal public facilities, such as the city markets in Entrop, Gurabesi, Dok IX, Hamadi and the public transport terminals in Youtefa and Entrop. This included modifying space in these areas to residential use.

On the urban fringe, informal settlements are built in areas designated for conservation, including adjoining high valued mangrove reserves. In terms of housing quality, houses in the settlements residing by mainly Papuan settlers in fringe areas have semi-permanent low quality. On the other hand, houses owned and built by Papuan and migrants from other islands which are located in urban centres and coastal mainly built with semi-permanent and permanent material, providing an average to good quality. Some of these houses obtain use permits from traditional owners as well as agreeing terms of land acquisition. There is no incentive to add here to formal rules and regulation in these settlements since these are regarded as illegal development.

As a general trend, settlers in urban centres have their place of origin from the western provinces of Indonesia, while settlers occupying the fringe areas come from other localities in Papua, or West Papua province. Settlements have no formal land status since they are built on state land or private land without consent of the land owners. Despite the overarching of all land ownerships, settlers often use informal or written permits from communal and traditional holders to occupy land. The permits are obtained by providing certain compensation to the tribal community for the land and use security. Such compensation includes cash, in kind, or share of interests in the development. This arrangement often triggers conflict between the government and settlers and the indigenous community (keondoafian) as each case is unique and outside the boundaries of government “one size fits all” approach.

Formal land governance in Jayapura is based on Law 5 of 1960 about Basic Agrarian Law, which puts National Land Board as the institution responsible to manage all types of land tenure and mediating land disputes. Several tenures acknowledged by the Law are state land, private or corporate land and traditional communal land (tanah adat). Particularly in Papua, Law 21 of 2001 recognises traditional communal land as one of formal land tenure. Thus, all parts of land and water in Papua have their traditional tribal ownership embedded in their formal land status. In wider Indonesia, the implementation formal land arrangements focuses mainly on state and private ownership, with lesser attention paid to traditional communal land (Daryono, 2010). The result is the duality of land systems, with increasing informal settlements now contributing to a plethora of informal governance systems in Jayapura.
In seeking to address increasing informality of settlement in Jayapura, the City Government attempted to enforce building and development control regulations by enacting City Regulation 5 of 2008 (General Spatial Plans). The latter detailed spatial plans comprise building regulations and development controls as well as the legal and administrative consequences of illegal use, occupation and development. Nevertheless, the implementation of rigid government regulation has not resulted in the decline of informal settlements including use or development; rather they have continued to accelerate in their expansion. As the City Government applied the Spatial Plan according to Law 26 of 2007 in 2008, informal settlements have flourished in the city areas.

A review of City Spatial Plan, 2012, shows that approximately 25% of the city area remains unplanned with informal housing of various kinds dominating this city area. Thus, attempts by City Government to implement spatial and development plans at a city wide level has had minimal affect especially in terms of public infrastructure and services (BAPPEDA Kota Jayapura, 2012). Contributing to this intrusion, there has been major alteration of city conservation areas to become settlement areas according to Regulation of Minister of Forestry 782/2012, have been reclassified city conservation areas, including critical land from 85.5% to only 36.13% and increased the area for urban development from 14.9% to 43.65%5. Thus, instead of acting as disincentive of growing informal settlements, these regulations have opened the opportunity for settlers to further spread out across the city.

Within the above setting, settlers have developed their own mechanisms in providing public services and amenities, including their communal and household needs. Other forms of development arrangements in Jayapura are individual development by the community. The communities in respective settlements either by groups or individually, manage to access public infrastructure and services such as water, electricity, waste disposal using their own mechanisms and resources. Regarding water supply, settlers build their own piping system delivering water from local springs to their houses using polyethylene pipes and rubber hoses, as can be seen in some areas such as APO, and Dok IX. There is no formal arrangement among users, adopting instead mutual unwritten agreements about how they share such resources.

Since the users comprise settlers from various ethnic backgrounds, it is often the head of neighborhood or community unit that takes responsibility to manage such arrangements. In some areas such as Buper Waena, Angkasa, Dok V, Dok IX and Pasir II, Papuan migrants build settlements next to water springs. Thus, the availability of a reliable water source is a key point for settlers when occupying land for settlements. Since many settlements are based on particular ethnic clans primarily from Papua, settlers develop more tribal based mechanisms in the use and management of water by replicating traditional rules brought from their original village and place of origin. Thus, it is common the head of tribal groups or “big men”

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5 These numbers are based on overlapping analysis on Jayapura Spatial Plan according to City Regulation 5/2008 and draft for Jayapura Spatial Plan 2012, conducted by BAPPEDA Kota Jayapura.
to be in charge of these high demand basic public services. Some other settlers also access clean water by make illegal connection to the public system owned by PDAM or City Government\textsuperscript{6}.

![Picture 1. Household self-helped water pipes in APO Bukit](Photo: BAPPEDA Kota Jayapura, 2013)

In addressing these gaps, Jayapura City Government has taken part in various initiatives. One such as initiative is a national program of poverty alleviation called the National Program for Community Empowerment (Program Nasional Pemberdayaan Masyarakat-PNPM) (PNPM, 2013)\textsuperscript{7}. Focused on Papua and West Papua, this program has two major schemes: PNPM Urban and PNPM Respek, the latter designed in relation to the special autonomy policy for this province. PNPM Urban is majorly funded by regular annual government budget, while PNPM Respek is funded by Special Autonomy Budget\textsuperscript{8}. PNPM Urban in Jayapura was initiated in 2007 by carrying out programs in 7 Kelurahan (sub-districts). The number of kelurahans or kampung and community groups involved in the program consistently increases to 39 in 2013. The number of volunteers also increases from 578 persons in 2007 to 2087 persons in 2010 (BAPPEDA Kota Jayapura, 2013). However, the sustainability of the projects in supporting the longer terms needs of communities remains uncertain.

\textsuperscript{6} Verbal communication of BAPPEDA with users in Angkasapura 2009, and APO Bukit and Dok IX, 22 August 2013.

\textsuperscript{7} The program was funded by Indonesian national budget and a soft loan from World Bank (World Bank, cited 25 July 2013) focusing on projects that addressed environmental, social and economic improvement.

\textsuperscript{8} Jayapura City Government is responsible in managing both schemes at municipal level. Coordination for conducting projects in infrastructure, economy and social improvement is the City Planning Agency (BAPPEDA) which has developed coordinating teams for Urban Poverty Alleviation.
Hybrid governance in Jayapura emerges not only in shaping physical development, but also in the overlapping economic and social sectors. Indigenous communities take responsibility for managing natural resources such as eco-tourism, as well as trading stores, plus organising urban security. In respect of natural resource management, indigenous clans recognised as the traditional land owners (pemilik hak ulayat) can manage tourism destinations in their localities, such as the beaches in Base G, Hamadi, and Skouw and Lake Sentani. They also work with the City Government on the provision of infrastructure such as roads and water (BAPPEDA Kota Jayapura, 2012). Papuan women working as street vendors apply traditional arrangements and protocols in sharing space for kiosks in urban centres, notwithstanding they face the threat of eviction in using public spaces as a location for trading. In regard to urban security, indigenous youths share responsibility with migrants groups in ensuring urban safety and security, especially at religious occasions. It is common in Jayapura that the Christian Youth Community be responsible for smoothing traffic flows and ensuring neighborhoods on Eid Day and Chinese New Year are safe.

3.2 Port Moresby, Papua New Guinea

While PNG may have the lowest rate of urbanisation in the Pacific Region – approximately 13% in 2000 - it has both the highest number of urban residents and largest number of towns and cities in the Pacific Region, namely, three formally declared cities (Port Moresby, Lae and Mt. Hagen) and seventeen provincial towns (Office of Urbanisation, 2010). In the most recent reliable recent census in 2000, the Port Moresby population was 254,158 persons, or just over one third of the then

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9 Papua Province government has provided space for traditional trading for Papuan women in urban centre of North Jayapura in 2009 addressing their aspiration for obtaining broader involvement in urban economy as enacted by Law 21 of 2001.

10 Result of author’s individual observations during 2001-2012.
PNG urban population of 675,403 persons (National Statistics Office, 2003). In 2008, the Port Moresby population was estimated at approximately 410,000 persons (UN-HABITAT, 2008), and at the end of 2012 was estimated to account for approximately 50% of the national urban population of one million persons, namely, around 500,000 to 600,000 persons.

In terms of formal government systems, Port Moresby sits within the National Capital District (NCD), a province of some 240 km² classified as urban, and containing peri-urban villages and a rural hinterland. Between 1980 and 2000, the annual average growth rate of Port Moresby was 4% percent, with some 58% of the NCD population being migrants from other provinces. The 2000 census estimated 90% of these migrants had moved to Port Moresby in the 1990-2000 period, with most migrants taking up occupation in the settlements (Chand and Yala, 2008). This population movement continues today in varying forms, and has contributed significantly to a landless class of settlers living in a plethora of settlements in and around Port Moresby (Office of Urbanisation, 2010).

The population growth of Port Moresby is increasingly located in growing settlements (Pyati, 2013). Like other towns and cities in PNG, settlements continue to expand and develop without adherence to formal rules and regulations (Alaluku, 2010). Port Moresby’s settlements are located on both State and customary land, with approximately 40% being customary, and 60% being on freehold or State land. The customary land in Port Moresby is owned by the coastal dwellers, the Motu Koita clans, and in 2006 accounted for some 37 settlements (NCDC, 2006).

In 2006, the NCDC estimated some 40% of the Port Moresby population were living in a range of settlement types (NCDC, 2006). In 2008, it was estimated 45% of Port Moresby’s population, namely, around 185,000 persons, lived in 99 settlements comprising 20 planned and 79 unplanned settlements (UN-HABITAT, 2008). This aligns with earlier estimates that indicated some 50% of the Port Moresby population lived in varying squatter settlements scattered throughout the city (UN-HABITAT, 2004). In 2000, there were only 55 settlements, and thus by 2008, settlements had been expanding at a rate of around 5 to 6 new settlements per year. Some researchers, such as those at the National Research Institute of PNG, have suggested that the number of new settlements being added each year in Port Moresby is as high as 20 (Anis, 2010). By July, 2013, it was estimated there were over 140 plus settlements scattered throughout the Port Moresby urban area, containing some 50% plus of the urban population (verbal communication, Office of Urbanisation, July, 2013).

The NCDC defines settlements in Port Moresby into three categories, namely, formal, squatter and Motu Koitabu settlements (NCDC, 2006). The NCDC categorises a squatter settlement as “a spontaneous community or cluster of families who initially invade or progressively settle in and make use of property, or a site, or area of land without consent of the rightful owners” (NCDC, 2006 p. vi). The Motu Koitabu settlements are the original indigenous villages of Port Moresby as occupied
by the traditional landowners, the Moiti Koita. These village settlements have been developed under the auspices of customary law and have expanded and grown over time by both natural population increase as well as by the influx of new migrants. On the other hand, the formal settlements refer to areas of low cost self-help housing provided with limited infrastructure on State land, the latter often put in place after the initial development. Whilst in the minority, the formal settlements reflect a form of ‘retro planning’ or in situ urban renewal, upgraded on the basis of formal planning and building standards. However, the amenity of the formal settlements varies, with unmaintained dwellings, environmental degradation and uncollected rubbish increasingly becoming the norm as population increases and housing is increasingly overcrowded. As such, the delineation between notions of ‘planned and unplanned’ in formal and squatter settlement areas, plus the Motu Koitabu settlements, is increasingly unclear.

It is increasingly documented in the literature that settlements are characterised by varying forms of governance, poor quality housing and minimal infrastructure, primarily water and power, with illegal connections common comprises the most extensive land use in the settlements (ADB, 2012; Chand and Yala, 2012; Jones 2012a; Pyati, 2010), with most houses constructed of traditional, semi-permanent and permanent materials. Although there are new permanent houses being built in some settlements, most settlers reside in self-help temporary houses, including run down vacated buildings which become their permanent places of shelter (UN-Habitat, 2008). There is much trading in land as well as housing, despite the insecurity and informal status of land agreements. Land transactions by customary owners have become increasingly common as they ‘sell’ their land and or the use of their customary land for attractive cash payments (Chand, 2008).

Settlements that have emerged on State land are effectively acquired by land invasion and occupation, while on customary land there exists both ‘sale and purchase’ of land rights and housing, and to a lesser degree, occupation by force. Despite the lack of clear title to land, an absence of secure land tenure does not constrain informal development (Chand and Yala, 2008a: 2012). This view in Port Moresby is supported by recent work in squatter settlements in Fiji, which indicated a continuum of use rights and arrangements exists, which may or may not constrain settlers in developing their land (Kiddle, 2010).

There is a range of infrastructure and services provided by varying means in the Port Moresby settlements. In the older established settlements which date back to the 1950s and 1960s, there are churches, community halls and recreation areas. Water is supplied to those who can afford a connection fee by Eda Ranu, the National Capital Development (NCD) water supplier. With the support of wider clan, kin and family groups in the settlements, households break water pipes and make their own connections to households, while others may share a public standpipe, or mix thereof. Although most settlements are outside of the NCD sewerage system, settlers use pit latrines, septic styled systems, or where location allows, the sea or bush, with only few households having flush toilets (Jones, 2012a).
All settlements have roads, mainly unsealed, and a reliable system of Public Motor Vehicles - small mini buses - which ensure ready access to all parts the city, including the many settlement markets and formal shopping centres. Where space and land suitability allows, gardening activities supplement household diets and are sold in settlement markets. Approximately one third of settlements have access to reticulated electricity, with Easi Pay (prepaid electricity) being common in the settlements (NCDC, 2006). Not surprisingly, there is little or no compliance and enforcement of planning and building provisions, with formal NCDC town plans and policies having little relevance on the lives of those residing in settlements. This is apparent in all settlements including the traditional Moita Koitabu villages such as Hanuabada Tatana, Taikoni, Vabukori and Gereka, which have existed before the establishment of Port Moresby and developed along customary lines (Pyati, 2013). As a result, the formal NCDC development plans for Port Moresby do not reflect a unified approach to development of the settlements because they remain viewed as illegal and temporal (UN-HABITAT, 2008).

Formal government structures and systems have little impact on those living in the settlements for a range of reasons. Participation in NCDC planning, budgeting, policy and decision making is virtually absent in the settlements. Under the NCDC Act, ward councilors are appointed rather than elected representatives, with many allocated to political cronies. Councilors also have little influence at the higher NCDC levels (Pyati, 2013). As a result, local governance arrangements and systems continue to strengthen, representing a complex set of groups and village committees, overlain in some settlements by formal institutions. Recent studies in Port Moresby have shown that settlements, despite their ad hoc appearance and irregular layouts to many outsiders, are far from “haphazard and disorganised” (Chand and Yala, 2012 p. 149). Governance arrangements have evolved to regulate, control and monitor settlers seeking approval for basic land planning and local infrastructure needs, such as
as allocating plots for housing, gardening, churches, market places, mini stores and public water supply standpipes, as well as ensuring vehicle and pedestrian access is not obstructed. Local governance systems embed in committee systems, “chiefs and big men” ensure urban security issues including law and order, are met often along traditional lines (Jones, 2012a).

In all of the above matters, including land tenure and land occupation, basic communal and individual rights as accepted by settlement communities are informally defined and enforced within the local contextual setting. The common theme in all of Port Moresby settlements is that settlers coalesce into groups and develop their governance arrangements based on clan, kin, region, plus influences that filter through professional and educational ties. The socio-cultural norms and values of the ethnic and clan group strongly frame how they go about their daily lives and meet their individual and collective governance needs. Importantly, land tenure type, length of settlement occupation, population size, and the relative heterogeneity and homogeneity of the settlement population by type of ethnic group and allegiance to a village, locality or region, all strongly influence the stability of the settlement and its governance arrangements.

Formal government intuitions such as the Village Court system, developed in the British and Australian colonial era, is one of the modern intuitions that still co-exists in the settlements, especially in the older squatter settlements and native (urban) villages, namely, the Moita Koitabu villages (Chand and Yala, 2012). Churches also play a strong unifying and stabilising role in maintaining governance systems in many settlements (Pyati, 2013).

In the above context, a key advantage for individuals and households in settlements in Port Moresby is that they are not relatively powerless as kinship as village based governance arrangements including wantok systems play a crucial support role for people and households especially those in hardship. As observed, governance systems are more effective and united where settlements grow along tribal and ethnic origins, such as in the case of Four Mile Settlement, for example, where settlements represent enclaves, or a series of enclaves, of kinship support from settlers originating from the Southern Highlands (Jones, 2011; Mawuli and Guy, 2007). This clustering into settlements based on kin, village and related regional affiliations is common across all of Port Moresby, as well as other larger centres in PNG. In Port Moresby’s Gorobe settlement as established in the early 1960’s, for example, some 54% of household heads come from Gulf Province, 23% from Central Province, while the remaining settlers come from Madang and Western Province (Chand and Yala, 2012). Not surprisingly, the myriad of settlements of Port Moresby have been described as “cosmopolitan networks of tribal groupings or anarchical sub-cultures, which have been defined by ethnicity and regionalism within an urban context” (Muke et al, 2001 p. 7).

With the growth of settlements and ‘village world’ bottom-up governance arrangements in Port Moresby, politicians are both reluctant and wary to with the
fabric of ‘informal’ governance operating in settlements (Jones, 2012b). As many settlements have been long established, governance structures and systems have been developed over time including recognising occupation agreements landowners and other ‘occupiers’ (legal or illegal). This includes sanctioning of practices which allow access to basic water supply and power (Jones, 2011). With increasing hardship in urban areas, the priority for many governance arrangements in settlements is focused on meeting the family, household and ‘urban village’ needs necessary for survival, including land, housing, sustaining livelihoods and urban security. 

Senior kin and clan statesmen who have attained reputation and respect, such as chiefs and “big men”, play important roles in mediating, representing, and politicizing the views of particular clans, settlements, or urban districts (ADB, 2012). This includes politicians who invariably have ethnic and kinship ties to settlers, and who are called upon to assist with household and social enclave issues regarding land, housing, or cash contributions for food, school bills, and travel back to rural villages for funerals or festivities. Resolving these ‘here and now’ activities take on greater social relevance and importance in local governance arrangements, rather than addressing wider NCDC and national government urban development plans and policies (Jones, 2012a). With increasing hardship and poverty, maintaining unity of governance arrangements as the demand to sell or to distribute assets such as land and housing increasingly come under pressure by settlement members. In this setting, politicians and “big men” are acutely aware of the unknown consequences of tampering with established and often sensitive local governance arrangements. These can, arise in settlements when grand and sometimes alien western plans, such as those promoted by development banks at a national and city level and need to be implemented locally, lead to disputes that did not openly exist, such as elevating underlying and simmering land and clan leadership challenges (Jones and Lea, 2007).

4. Results and Main Findings

The proliferation of informal settlements in Jayapura and Port Moresby with their own systems of decision-making and wider governance arrangements reflect deep seated change that is evident across a myriad of both Indonesian and Pacific towns and cities. Such change is most prevalent in the deteriorating urban setting of the larger Melanesian towns and cities, such as Port Moresby (Connell and Lea, 2002; Jones and Lea, 2007). The permanency and extent of settlements, combined with the inability of formal government systems to address the depth of both existing town and city issues (including future urban growth scenarios), all contribute to the emergence of hybrid forms of governance arrangements. While some researchers have portrayed settlements as being outside the bounds of the ‘legitimate city’ (see, for example, Watson, 2009), they are increasingly more and more representing the ‘real city’ as planned development under formal governance arrangements becomes a minority concept. The emerging trend is an increase in settlements in both number and size, accompanied by varying systems of governance to meet the demands of
their urban experience. “Because …. that is normal, that’s what there is. That’s their urban fabric, that’s their urban village” (Jones, 2013 p.21).

The reality is that a multitude of different actors, stakeholders, institutions and arrangements, formal and informal, however defined, contribute to the building of the dynamic city (Nunan and Devas, 2004). In both case study examples, a high diversity of ethnic groups have contributed to the development of varying models of urban governance, reflecting adaptation of both western and local Melanesian governance unique to their urban experience in their city contexts.

Some literature argues that city governance can be classified as formal and informal, with informal arrangements being a deviation of the planned, and regulated formal systems (Jones, 2011; Hall and Pfeiffer, 2000 in Roy, 2005) (see Figure 1). The intersection between both realms is acknowledged as both an acceptance and toleration from the government to the increase of urban informality due to an inability to provide adequate public infrastructure and social services to the overall city population. Alternative governance arrangements fill the gap where formal government is considered irrelevant or not meeting a need. This can be seen in Port Moresby, for example, where wantok systems remain strong in influencing the management of settlements, including how village committees and “big men” resolve disputes regarding land, housing and access to public utilities within the settlements. On the other hand, formal government in Jayapura has made efforts towards integrating traditional governance in respect of land matters and formalising community village groups.

![Figure 1: Traditional view on urban governance](source: Authors)

What is being increasingly seen in settlement communities in Jayapura and Port Moresby is an increasing plethora of urban governance arrangements which have been formed in response to (i) the poor performance of formal governance institutions and processes which are out of step with meting current quality of life needs, and (ii) the deteriorating physical and social condition of towns and cities
generally. Formal governance in both Port Moresby and Jayapura show significant commonalities, noting strong colonial influence in both cities: the British - Australian system in Port Moresby, and Dutch-American systems in Jayapura. While Port Moresby shows a trend of permanency in settlements which are influenced by tribe, clan and kinship connections, affiliations, norms and values, Jayapura also shows a wide range of hybrid arrangements between formal and informal forms in service and infrastructure provision. However, in both examples, it can be well argued that while they may be classed as informal, they are still planned and regulated according to varying local governance systems comprising rules, regulations, norms and values (see Figure 2).

**Figure 2: Emerging View on Urban Governance**  
*Source: Authors.*

5. **Conclusion**

In summary, formal urban governance in Melanesian cities has resulted in not only the implementation of western bureaucrat style plans and policies, but also the rise of informal urbanism as expressed in a diversity of informal governance arrangements. The inability of formal government to recognise and meet the urban needs of the overall city population correlates strongly to the varied forms of informal urban governance now emerging at both different spatial levels, and in settlement forms.

Various initiatives have been suggested to address growing quality of life issues in settlements, especially their implications for urban management, service and infrastructure delivery. These include making more formal land available, such as customary land as being piloted with landowners in Port Moresby and elsewhere in PNG, and formalising settlements on customary and State lands (AusAID, 2008: 1-63.
Jones, 2013). In Jayapura, establishment of practical guidelines of land management as enacted by Law 5 of 1960 and Law 21 of 2001 is crucial in managing issues between formal and informal land tenures. Further exploration of the forms of governance as evolving will contribute to a better understanding of the nature of urban governance, including options to support settlements in the more effective provision of urban infrastructure and services and their overall management.

Reaching the above position requires a major shift in the mindset of many researchers, policy makers, politicians and development partners in their perception and understanding of how governance really works in the building of the contemporary city. Relooking at both formal and informal settlements through different governance and management lenses will continue to be a paramount and an overdue challenge for development partners, governments and other stakeholders in Indonesia, PNG and the broader region.

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ASSESSING TRANSPORT DISADVANTAGE AND TRANSPORT-RELATED SOCIAL EXCLUSION FOR INCLUSIVE TRANSPORTATION PLANNING: A REVIEW OF METHODOLOGY

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Abstract

It has long been recognized that transport has a significant effect on the occurrence of social exclusion. The absence or lack of access to transport can cause a person or group in difficulty to participate in various activities, such as difficulty of getting jobs, education, health care, and difficulty participating in arts and cultural activities. Individuals or groups that hampered his participation due to lack of access to transport is stated in literatures as experiencing transport-related social exclusion (TRSE). Other term to explain what happened to the person or the group is transport or mobility disadvantage, although the two terms are not always synonymous. Transport-related social exclusion is usually experienced by the poorest people (which are only able to live in a place with limited accessibility) and those who are socially disadvantaged such as people with disabilities, the elderly, women and people from ethnic minorities. For inclusive transportation planning, accommodating the interests of each group, including marginalized groups is critical. In this regard, this paper aims to examine the various methods that have been developed to identify the occurrence of transport-related social exclusion as an input for an inclusive transportation planning. The method used in this paper is literature review. Based on the review, there are three methods used in assessing transport disadvantage and TRSE, which are GIS, modelling and statistical analysis, and qualitative analysis. These three methods have its own advantage and disadvantage and could complement each other. There are also some issues in utilizing these methods in Indonesia, which are: data availability and cultural barriers.

Keywords: transport-related social exclusion, inclusive planning, methodology

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1. Introduction

Inclusive planning is becoming a discourse in Indonesia development planning at this moment. This happens especially after the enactment of Presidential Instruction (Inpres) No. 3 of 2010 about Equitable Development Program (Program Pembangunan Berkeadilan). One of the programs is called Justice for All programs. This program included: justice for children, women, employment, legal aid, legal and judicial reform, as well as justice programs for the poor and marginalized. However, among the programs included, it is still largely focused on the provision of social assistance. In this case the role of planning, in particular transportation planning, in improving the inclusiveness of marginalized groups still not be accommodated through the Instruction.

Meanwhile, the role of transport in the occurrence of social exclusion has long been recognised in research in developed countries. The absence or lack of access to transport can cause a person or group in difficulty to participate in various activities, such as difficulty of getting jobs, education, health care, and difficulty participating in arts and cultural activities (SEU, 2001; Currie, 2009; Johnson, Currie and Stanley, 2011). Individuals or groups that hampered his participation due to lack of access to transport is stated in literatures as experiencing transport-related social exclusion (TRSE).

It is important, therefore, to understand the method that can be used to assess transport disadvantage and TRSE in Indonesia in order to accommodate the different interest of marginalised group as an input for inclusive transportation planning. In this regard, this paper aims to examine the various methods that have been developed to identify the occurrence of transport-related social exclusion as an input for an inclusive transportation planning. For this purpose, the paper starts with short review of literature examining the concept of transport disadvantage and TRSE. This is followed by explanation of different methodological approach in assessing transport disadvantage and TRSE. It is then concluded by methodological challenges in accessing transport disadvantage and TRSE in Indonesian context.

1. Transport Disadvantage and Transport-related Social Exclusion

The link between social exclusion and transport began to attract attention in the last ten years (Delbosch and Currie, 2011: 556). However, the social impact of transport is the least discussed aspect compared to the economic and social impact (Jones and Lucas, 2012). In transportation field, the issue of social exclusion arises from the understanding that the availability of transportation services can have social impacts on different individuals and certain groups (Banister and Hall, 1981). Individuals and groups, who are not served by existing transportation systems, can suffer social exclusion due to lack of access to opportunities (Preston and Raje, 2007). They are groups or individuals who experience transport-related social exclusion. Other term to explain what happened to the person or the group is transport or mobility disadvantage, although the two terms are not always synonymous (Lucas, 2012). Someone who is experiencing transport disadvantage is not necessarily experiencing
social exclusion, as well as someone who experienced social exclusion is not necessarily caused by transport disadvantage.

In the research on transport and social exclusion, there are two commonly used approaches, namely: category approach and spatial approach (Church, 2000). Category approach relates to the conditions attached to the individual, such as: age, disability, gender, and race (Johnson, 2011; Lucas, 2012) while the spatial approach related to the conditions associated with the area where the individual is living, for example: downtown area, ghetto (Cervero and Tsai, 2003; Cervero, 2004 in Delbosch and Currie, 2011) and suburb (Currie and Delbosch, 2009). Therefore, social exclusion in transport are usually experienced by the poorest people (which is only able to live in a place with limited accessibility) and those who are socially experienced obstacles such as people with disabilities, the elderly, women, and people who came from ethnic minorities (Lucas, 2012). This is in line with research from Preston and Raje (2007) who found that transport-related social exclusion is the result of a combination of the area accessibility, mobility accessibility, and individual mobility.

Social barriers experienced by people or groups who have transport disadvantage are included: difficulty in accessing employment, basic public facilities such as health and education, difficulties in participating in social activities, and the inability to travel out (The Social Policy Research Unit, University of York, 2000). In his writing, Church (2000) classifies mobility limitations experienced by people who are socially excluded into 6 categories:

1. Physical exclusion: occurs when physical limitations hinder the accessibility of the movement of people or certain groups, such as vehicle design, the lack of facilities for the disabled, or the lack of information about the travel schedule.
2. Geographic exclusion: occurs when settlement location prevent someone or some groups from accessing transportation services, for example: the suburbs that have limited accessibility
3. Exclusion of facilities: occurs when the distance and the availability of existing public facilities hinder a person or group of people to access the facility.
4. Economic exclusion: occurs when the cost to travel inhibits a person or group of people to access facilities or work that affects earnings.
5. Exclusion related to time: occurs when the need of time to do other activities such as: raising children, caring for sick family members, reducing the availability of time to travel
6. Exclusion related fear: occurs when the fear of personal safety, inhibits a person to use a public space or public transportation.
7. Exclusion of space: occurs when spatial arrangement inhibits a person or group of people to access public spaces, such as the VIP waiting room at the station.

According to Lucas (2004), there are many variations of the reasons that drive a person is in an excluded condition. The reasons can be grouped into three main
factors that affect the accessibility of a person, which in turn affects the transport-related social exclusion. Those factors are: 1) activity factor, which is related to settlement type, topography, environment, infrastructure conditions, the condition of local service facilities, 2) personal factor, related to age, gender, ethnicity, dependability, responsibility, revenues, and 3) transportation factor, relating to the type, availability, suitability, travel costs, and information (Lucas, 2004: 43). These three factors interact and influence an individual's decision whether to continue with the activities that have been planned, reschedule or relocate their activities, or leave the event when other options are not available.

Social exclusion problems related to the accessibility factor encouraging research, especially in developed countries, such as UK, USA, and Australia. Discussion of social exclusion associated with transport began in 1998 with the publication of the 1998 UK White Paper on Transport which is one of the contents expressed the need for integration of transport with education policy, health and welfare policy so as to form a more equitable and inclusive community (Church et al, 2000). This statement was followed by numerous studies. One was published in 2003, Making the Connection: Final Report on Transport and Social Exclusion. This report was followed by other studies, both in the UK as well as in other developed countries such as the United States, the Netherlands, Australia and other European countries. The study covers the extent of social exclusion in the transport, how to calculate and to integrate social exclusion issues in transportation policy, and assess the impact of a transport policy on social exclusion. Lucas (2012) stated that one of results of these studies is that transport-related social exclusion depends on the context and circumstances of each individual.

In developing countries, the study of the social impact of the transport system is still not widely practiced. Though the number of the poor and the lack of public transport services in developing countries, transport-related social exclusion is likely to occur. In Bogota, Colombia, the total frequency of trips of residents in the poorest parts of the city only reached 1.5 trips per day, while the cost of transportation reached 20% of the total income. (Bocarejo and Oviedo, 2012). In Indonesia, the population in urban slums in Jakarta, Yogyakarta and Solo, spend 10% of their income on transportation (Renny, 2009). With the low level of public transport services, the poor in these cities also had to have a motorcycle, without thinking of safety and pollution resulting from the vehicle (Renny, 2009). It is thought to also occur on the poor who live in the suburbs, where access to public transport is limited.

For inclusive transportation planning, accommodating the interests of different groups, including marginalized groups is critical. So that, it is important to recognise the possibility of transport disadvantage or TRSE occurred in a particular area or community as an input. In this regards, there are some methods used in the research about transport disadvantage and TRSE. In those researches the term transport and TRSE are used alone or together.

The term TRSE cannot be separated from transport disadvantage, although it has been said that the two terms are not always synonymous. In some studies, both terms
is defined similarly. For example Stanley and Stanley (2004, p: 14), define transport disadvantage as “a situation where people experience a shortage of transport options, which restricts their mobility and hence their access to goods, services and relationships”. While Warren in her paper *Transport Disadvantage: a significant issue in an unequal society* stated that a person or family considered suffering disadvantage if: they are hampered from opportunity because of the travel problem, including the cost of transportation that is too high for them; or because the transport problem restrict where they can live.

Hurni (2006) said that transport disadvantage involves transport disadvantaged areas and transport disadvantaged groups of people. Thus, transport-related social exclusion emerged in the situation where people with transport difficulties (transport disadvantage group) live in transport disadvantaged areas. Therefore transport disadvantage is considered as one of the causes exuberate social exclusion through barriers to important services (Delbosch and Currie, 2011).

2. Methodological approach in assessing transport disadvantage and transport-related social exclusion

Assessing transport disadvantage and transport-related social exclusion can be executed in macro and mezzo level by area-based method and micro level through person-based method. In assessing transport disadvantage and TRSE using area-based method, public transport performance indicators are used. Areas that are lacking or are not served by public transport, considered as areas experiencing transport disadvantage. From various studies conducted for assessing transport disadvantage and TRSE, there are 3 main methods used which are GIS, modelling and statistics, and qualitative analysis. Each of these methods has its own advantages and disadvantages.

In term of scale of the data, analysis of transport disadvantage and TRSE using GIS method needs data in area-based unit analysis. Modelling and statistical method could use area-based and person-based data, while qualitative method needs person-based data. For the analysis using GIS method result in aggregate geographical level of analysis, while using qualitative method enable disaggregate individual or household level of analysis. For analysis using modelling and statistical method it depends on the scale of the data. If the data used are in area based level that it will result in aggregate level of analysis, but if the scale of the data is person or household level then it could generate analysis in aggregate geographical level or disaggregate group level.

<table>
<thead>
<tr>
<th>Method</th>
<th>Scale of the Data</th>
<th>Type of Analysis</th>
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<tbody>
<tr>
<td>GIS</td>
<td>Area-based</td>
<td>Aggregate (geographical level)</td>
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<tr>
<td>Method</td>
<td>Scale of the Data</td>
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<tr>
<td>Modelling and Statistical</td>
<td>Area-based or person-based</td>
<td>Aggregate (geographical level) or dis-aggregate (groups level)</td>
</tr>
<tr>
<td>Qualitative analysis</td>
<td>Person-based</td>
<td>Disaggregate (individual or household level)</td>
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2.1. Geographic Information System (GIS)

The use of GIS to assess transport disadvantage and transport-related social exclusion allows the combination of various types of spatial information with other information to map the various characteristics of the transport system (Dodson et.al, 2004). Analysis made by this method can be carried out starting from the simple to multiple variables.

GIS method often uses in the studies about the level of service of transport service and other public facilities. Example of this kind of analysis can be found in Murray et.al (1998), Hurni (2006), and Miller (2009) studies. In his study, Murray identified suitable public transport access, which is area in South East Queensland that is covered by public transport. For that purpose, Murray used 400m coverage distance from bus, tram, or rail station as a standard for an area to be classified as suitable public transport area. A more complex data of public transport service was used by Hurni. Hurni examined the transport disadvantage area in Western Sydney using proximity to a transport stop data and frequency of service at the stop data. For the proximity to a transport stop, Hurni used 800m buffer standard to define what it called ‘transport disadvantage CDs (Census collection Districts)’ and ‘transport accessible CDs’.

It terms of data, analysing transport disadvantage and TRSE using GIS analysis could incorporate two kinds of data, which are:

1. Public transport service data, such as: location of the bus station, bus stop, and train station, list of rail, bus, or tram routes, bus service level (service frequencies), access distance to each stop/station (the GIS term used is buffers), travel time, and waiting time.

2. Demographic and social economic data, such as: vehicle ownership, income, distribution of people with disabilities, ethnic minorities, household/family status, and age.

The combination of two kinds of data (transport data and social economic data) creates more sophisticated GIS analysis as demonstrated by Miller (2009). In his study, Miller incorporated the data of walk accessibility, bus supply index and overlaid it with socio-economic data.
The drawback of this method is it requires the availability of adequate spatial data and combinations for a good analysis, which is largely depends on secondary resources. In some area such as in developing country like Indonesia, this kind of data hardly available. Moreover, assess transport disadvantage and TRSE using GIS methods cannot look at things that are subjective and specific because it uses area as the unit of analysis. Whereas social exclusion is a personal experience.

Modelling and Statistical Method

The simplest assessment of transport disadvantage and TRSE is by using descriptive statistics. Some examples for that is the study from Robinson et.al (2000); Robinson explores the shopping difficulties experienced by low-income shoppers by looking at the frequency distribution of respondent’s answer in the form of percentage. The limitation of using descriptive statistics is it can only give an overview of the current or past condition, without providing tools to look at the correlation with other factors. Moreover, if descriptive statistics is used for data taken from sample, it will only represent the analysis for the sample, not the population.
Studies that using more complex analysis using multivariate statistics was done by Raje (2007), and Bocarejo et.al (2012). Raje used an explanatory study using Q methodology which is an alternate method that offers a way of revealing patterns that is caused by the same attitudes toward something (Raje, 2007) to investigate perceptions of transport’s role in people’s lives. It is an alternate technique from factor analysis, the more common technique in multivariate statistics. The distinguished features of Q is that it does not use concepts or measures that have been pre-specified by researcher, such as gender, age, and other demographic characteristics (Adams and Proops, 2000 in Raje, 2007). By using this method, Raje found four discourse regarding the role of transport’s in someone’s live which are: the contented resident, the multi-mode advocate, the car as escape from local deficiencies, the multi-mode advocate, and the disaffected theorist. Another way of using multivariate analysis is demonstrated by Bocarejo et.al (2012) and Kamruzzaman and Hine (2011). Both of the studies used multiple regression technique to assess transport disadvantage and TRSE. Bocarejo et.al tried to identifying transport disadvantage by calculating accessibility levels to the labour market for different zones of 10 cities in Columbia as a function of travel times and travel expenditures, while Kamruzzaman and Hine used area profile, gender, car-ownership, income, age, occupation as explanatory variables for participation.

Assessing transport disadvantage and TRSE using models and statistical methods as demonstrated by Robinson el. al (2000), Raje (2007), Kamruzzaman and Hine (2011) and Bocarejo and Oviedo (2012) have some advantages. Among them are the results obtained are quantitative so that it is more practical as policy input. According to Dodson (2004), the use of modelling to assess the transport disadvantage meets the ‘objective’ and ‘scientific’ qualification so that it is often used politically to justify a policy. In term of data collection, this method could use the data obtained from secondary data sources that already exist. It could be seen as a benefit if the database about transport service and social status of the community are available and up to date. However, it could be a drawback if such data does not exist.

As the purpose of making a model is a simplification of the actual conditions, the weakness of this method in assessing transport and TRSE disadvantage is there is a chance that important variables are not included in the model. As shown in Kamruzzaman and Hine’ study, transport disadvantage as indicate in this study by participation index cannot be explained by the explanatory variables alone. The interaction between the explanatory variables was found to have significant effects in the models, instead. From that it can be inferred that other variables that were not included in the model may also have affect the participation.

In term of level of analysis, the use of modelling and statistical method also allows the aggregate analysis, i.e. assessing the transport disadvantage and TRSE in a single number or index, as well as disaggregates by assessing the occurrence and TRSE transport disadvantage per components. The use of aggregate and disaggregate analysis of this methods can be found in the studies explained above.
2.2. Qualitative Analysis

The advantage of using qualitative methods to assess the occurrence of disadvantage is that it can generate subjective and personal information of individuals who become the target of the research. This is in line with the idea underlying the birth of the concept of social exclusion in the transport, that realize there are certain people or groups who have difficulty doing activities that are considered normal by the surrounding community. In this case the person or group is usually a marginal or minority groups so their interest is often not identified by using the generalist method.

Examples of studies using qualitative method are the studies undertaken by Hine and Mitchell (2001, 2003) and McGrath et.al (2007). In Hine and Mitchell first study (2001), the transportation barriers experienced by transport disadvantage group is explored. Based on the data taken from three projects, this study examines people’s travel experiences in order to develop understanding of the factors that influence an individual’s choice of travel. In all three projects, the data was taken from interview based on the personal characteristics. Sample are taken based on age, gender, disability (visually impaired), and socio-economic status (employment status, low income). In one of the project which involved visually impaired people, the researcher conduct two level of interview, which involved 6 exploratory interviews and further 15 interviews to get a better understanding of the information obtained from the first interview. All of the data is presented in the form of non-quantified statement which represent respondent’s travel experiences. The second study by Hine and Mitchell was conducted to explore the transport need and transport-related social exclusion in urban Scotland. The data gathering involved household’s survey, and interviews. Some of the result of this study presented in the form of descriptical statistics and non-quantified statement from the respondents.

The difficulty in using this method to assess transport disadvantage and TRSE is the need for intensive primary data collection through interviews. To reduce the difficulty in collecting the primary data, some studies (Department for Transport (DETR), 2000; McGrath et.al, 2007) using the combination of interview, questionnaires, focus group and informal group discussion method. With focus group, the information from the respondents can be explored without having to do one by one interview. However, the disadvantage is, there is a possibility that respondents hide some information because of the shame when they have to disclose the topic is considered as a deficiency in front of many people.
3. Methodological challenges in accessing transport disadvantage and transport-related social exclusion in Indonesian context

The review of the methods in assessing transport disadvantage and TRSE shows that every method has its own advantage and disadvantage. For that reason, many of the studies about transport disadvantage and TRSE used combination of two or more methods. As can be seen in Table 1.

**Table 1. Methods used in assessing transport disadvantage and TRSE**

<table>
<thead>
<tr>
<th>No.</th>
<th>Source</th>
<th>GIS</th>
<th>Modelling and Statistical Method</th>
<th>Qualitative Analysis</th>
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<tbody>
<tr>
<td>1</td>
<td>Bocarejo and Oviedo (2012)</td>
<td>✓</td>
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<td>2</td>
<td>Buchanan, Evans and Dodson (2005)</td>
<td></td>
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<td>✓</td>
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<tr>
<td>3</td>
<td>Currie et.al, 2009, Delbosch and Currie (2011)</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>4</td>
<td>Currie and Sendbergs, 2007</td>
<td>✓</td>
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<td>5</td>
<td>DETR (2000)</td>
<td>✓</td>
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<td>6</td>
<td>Hine and Mitchell (2001)</td>
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<td>7</td>
<td>Hine and Mitchell (2003)</td>
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<td>8</td>
<td>Hurni (2006)</td>
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<td>9</td>
<td>Kamruzzaman and Hine (2011)</td>
<td>✓</td>
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<td>10</td>
<td>McGrath (2007)</td>
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<td>11</td>
<td>Miller (2009)</td>
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<td>12</td>
<td>Murray et.al (1998)</td>
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<td>14</td>
<td>Raje (2007)</td>
<td>✓</td>
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<tr>
<td>15</td>
<td>Robinson et.al (2000)</td>
<td>✓</td>
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</tbody>
</table>

Although many research has been done about transport disadvantage and TRSE in developed countries, research on the same topics in Indonesia is still limited. One of them is case studies on transport challenges for the poor (Maria, 2009). The study examines the respondents from four slum settlements in Jakarta, Yogyakarta, and Solo. The purpose of the study is to identify the travel pattern of slum dwellers including where they travel to, the distance, transport mode used, and travel cost. In this study, the data was analysed using descriptive statistical methods. The study found travel characteristics by slum-dwellers in 3 major cities. However, this study did not investigate further into the impact of transport to the possibility of social exclusion of the communities.
One of the reasons research on the social impact of transport is still limited in Indonesia is because it is still focusing more on the economical impact. For example in the document of Yogyakarta Transportation Planning (Tataran Transportasi Wilayah or Tatrawil Yogyakarta), social goals are still not disclosed. Other causes are limited data about public transport service regarding: waiting time, frequency of service, travel time, access time to and from public transport, and more subjective variable such as comfort and safety which is considered as determinant variables in assessing the occurrence of transport disadvantage and TRSE in an area. Therefore assessing the TRSE in Indonesia using GIS or modelling methods that rely on secondary data becomes challenging. For analysis using area-based data such as GIS and modelling, the availability of spatial and temporal datasets are crucial in accessing the accessibility of public transport service which is one of the important indicator in assessing the transport disadvantage and TRSE.

Furthermore, social exclusion is a multidimensional issue that requires a deepening of the issue at family/individual level. It requires the collection of data at the level of families or individuals to explore their experiences regarding the transport disadvantage and TRSE. Based on this, the combination of quantitative methods (GIS or modelling/statistical) and qualitative method can be considered to obtain an adequate analysis as an input for inclusive transportation planning. GIS methods can be used to get a broader picture of the areas experiencing transport disadvantage. It could utilize data that is generally available in Indonesia, such as public transport routes and bus stop locations, terminal, or station. From these data, combined with spatial data such as land use, the residential area with no or limited public transport service could be identified as transport disadvantage area. Surely it would be better if the more complete data about public transport service such as the frequency of public transport and waiting times at the stations is available. This could be followed by statistical and qualitative analysis using questionnaire or interview to the residents resides in the area to get a better overview of their experiences in participating in economics, social, and politics activities as an indicator of social exclusion that may happened in the area.

In term of utilizing qualitative method to assess transport disadvantage and TRSE in Indonesia, there is another challenge which is the cultural barrier. Many Indonesians think that revealing the difficulties especially economic distress to non-family or non relative is not appropriate. As a result, negative conditions cannot be explored properly. Besides, the absence of references other than the present condition may also cause respondents tended to give positive response to their experience regarding the transport disadvantage. To overcome this, it is necessary to carefully choose the questions for the interview. A good communication skill of the interviewer is also needed.
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THE PROPOSAL OF TRANSPORTATION DEMAND MANAGEMENT IMPLEMENTATION IN CITY CENTRE OF BANDUNG AS THE SOLUTION TO URBAN TRANSPORTATION PROBLEMS

Case Study: Alun-Alun of Bandung

Fernando SITUNGKIR 1, Iwan Pratoyo KUSUMANTORO 2

Abstract

Public acceptance and the effectiveness have the same level of importance to determine the reliability of transportation demand management (TDM) strategies. This paper examines the probability changes of public acceptance which are related to community motorized travel behavior and strategies ability to decrease the motorized travels in the city center of Bandung as future impact of TDM strategies implementation. Using the ordinal logistic regression, car users who travel around Alun-Alun of Bandung state their acceptance to TDM three independent and combination strategies proposal, shortly categorized into incentives, disincentives, and the combination strategies. Each possibility of acceptance is analyzed from three types of car users’ characteristics, namely social, economic, and travel behavior. The analysis shows that incentives strategies are more acceptable and preferable, but since the disincentives strategies are still needed to control the motorized travels, the combination strategies are then offered and finally raised a higher acceptance. Although the parking pricing package strategy decrease the travels more, it still have to be placed as alternative since the road pricing package strategy have less burdens to be born with. Dissemination of information about the revenues allocation and transportation problems is also needed since it increased the probability to choose the road pricing package strategy.

Keywords: Incentives, Disincentives, Public Acceptance, Transportation Demand Management, Motorized Travel Behavior

1. Introduction

Traffic congestion is now a common phenomenon of urban transportation problem. The imbalance of transportation demand and supply was the major factor which caused this problem. This imbalance came from some other causes such as government financial limitation and the other higher urban development priority. Regarding to that, government had already developed conventional approach to solve this problem by increasing road capacity and building a new road. This conventional approach actually was able to solve the problems, but only the short term period type

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because Tamin (1999) explained that the conventional approach tended to move the exact same problem to the future and made it more complicated as the result of population growth, vehicle ownership, economic growth, and so on which increased the demand for transportation infrastructures that lead to this problem. As this demand continuously grew, this approach became no more reliable. Responding to this result, the demand approach was then promoted. By intervening demand for transportation infrastructures, planner can build a better transportation system and also government will receive the effectiveness and efficiency in transportation infrastructure expenditures related to its provision. Transportation demand management (TDM) then are common terminology to explain the demand approach.

TDM is now a common terminology to describe the demand approach which has the ability to solve the urban transportation problems by decreasing the travel to its normal limit (Tamin, 1999). The terminology of demand limitation in this study refers to some kind of travel management which make the travel at least did not happen in the same time or place. Several countries have implemented the TDM strategies, such as the parking management in Great Britain, toll rings, toll tag, and toll cash in Norway and South Korea, ERP (Electronic Road Pricing) in Singapore, and the improvement of mass transportation services in Sweden. Until now, Indonesia has not been very much implemented the TDM strategies, such as the three in one lane in Jakarta, the trial of the four in one lane in Bandung, and the improvement of bus as the mass transportation mode and the car free day in several cities in Indonesia.

Bandung is one of the major city in Indonesia and also a national strategic region which is designated as the part of National Activity Centre (Pusat Kegiatan Nasional) of Greater Bandung Area based on government regulation no. 26 circa 2008 about national spatial plan. As a part of the national activity centre, Bandung has some potentials which able to increase its economy growth. The growth of economy activities is one of the obvious realization of those potentials. The economy growth in Bandung stimulated the travel growth, for instance the growth of motorization travel at rate 6% per year (Kusumantoro, 2007). With this increasing rate, transportation infrastructures in Bandung will someday not be able to bear the number of travel and finally lead them to urban transportation. Other factors that also gave contribution to urban transportation problems were the concentrated activities distribution-formed site planning the lack of transportation management (Pontoh, et al., 2008).

The City of Bandung Spatial Plan in 2010 – 2030 stated that in solving the transportation problems, the government of Bandung will adapt the TDM strategies by implementing them on the arterial roads and around the primary activity centre which is The Alun-Alun of Bandung. Those strategies are parking management, road pricing, and alternative mode development. The aims of adopting these strategies are to restrict the motorized travels in and around the primary activity centre and to move those to the other primary activates centre of Gedebage. Previous study (Kusumantoro, 2007) explained that based on the urban transportation problems of
Bandung, there are some preferable strategies, they are congestion pricing, ridesharing, and improving mass transportation services, the campaign of the good travel behaviour, the establishment of information centre, and the development of TDM policies which encourage the implementation of the hard strategies of TDM (Kusumantoro, 2007).

Not all of TDM implementations ended successfully, some of them are failed. Public acceptance is one major factor that able to succeed TDM implementation (Thrope, et al., 2000; Erikson, et al., 2006). In this case, public acceptance is the public interest to participate in supporting the implementation of TDM strategies based on their perceptions of the cost and benefit they will receive. Besides public acceptance, there are other factors that also succeed TDM implementation, such as the incentive-disincentive practice (Meyer, 1999), politic sensitivity support (Stewart & Pringle, 1997), coercion action, publication and public approaching, implementation level of certain TDM strategies, level of area, and traveller characteristics (Pontoh, et al., 2008).

Previous studies about TDM implementation seemed to present a general solution, which were based on the generally-viewed problems, so the TDM strategies could not explain the alternatives or accommodations for the people who received TDM implementation disadvantages. The lack of accommodations for this people are the main point that this study is focus about. By considering the ability of TDM strategies to influence community attitude, this study tries to explain the description about the TDM strategies ability to accommodate the marginal group of people who receive the disadvantages. This consideration is important because it will indirectly describe us the community participation level to implement the strategies, since public acceptance can indicate the failure of TDM goals achievement even though the reliable authorities do exist (Kitamura, et al., 1999).

2. Transportation Demand Management as the demand approach to solve urban transportation problems

The origin idea of demand approach in solving the urban transportation management came from the adaptation to respond the crisis of energy resources in United States in 1970’s and 1980’s (Leotta, 2007). As the price of the fuel and energy resources went stable, the uses of motorized vehicles became grow rapidly as the result of the presence of distance due to more community lived in suburb area. In addition to that, the freight shifting from rail base to road base also increased traffic volume and made road bore more. As the city grew along with its activities, some factors appeared in making the transportation problems became more complicated, such as population growth, the sprawl phenomenon, the dynamic of city growth, the growth of single housing, the radial-type transportation system, single capacity load-vehicle, the vehicle ownership increasing, the coordination between problem-related actors, and so on (Edwards & Smith, 2004).
Since so many experts gave the definition of Transportation Demand Management, there are two major components of TDM, include the modification of travel demands by giving some travel alternatives, and the reduction of travel demand, for instance the reduction of the travel length and the number of travel, and so on (Litman, 1999; Meyer, 1999; Ferguson, 2000; Stalenbrink & Gifford, 2001). Previous studies had grouped the strategies into some groups, but basically the whole point of these strategies are all the same, only the way on viewing them are a little bit different, such as Ferguson (2000) grouped them into three group, namely voluntarism, market, and regulation types, and Litman (1999) grouped them into six group, namely the strategies which promote the alternative modes, the strategies which promote parking management, the strategies which promote policy programs, the strategies which encourage the disincentives, the strategies which increase the cost of travels, and the strategies which directly relate to land use management.

TDM implementation successes were very depending on many conditions like when and where the TDM strategies were implemented. Several factors which encourage to achieve TDM goals are (1) the scale of area, (2) level of actors, (3) the type of strategies, (4) political situations, (5) financial ability, and (6) equity issue (Stewart & Pringle, 1997; Meyer, 1999; Thrope, et al., 2000; Anon., 2000; Erikson, et al., 2006; Pontooh, et al., 2008). In Indonesia, some cities like Semarang, Cilegon, Bandung, and Surabaya have implemented TDM strategies which is mass transportation improvement (Kusumantoro, 2007).

TDM implementation is not the business between local government and community only. Carlson, et al., (2005) in his article explained that actually there were some important actors who could involve in TDM implementation and later grouped into 11 groups, such as (1) legislative staff, (2) transportation planning board staff, (3) transportation commission, (4) local authorities, (5) transportation management organization, (6) urban planning organization, (7) transportation management association, (8) private business, (9), the visionaries, sceptics, and academicians, (10) environmental protection organizations, and (11) national government.

Public acceptance is one major factor that can indicate the success of TDM implementation, beside its effectiveness (Thrope, et al., 2000) . There are some issues that also come along with this public acceptance, namely personal norm, which include the perception on fairness and equity, perception on freedom infringement, perception on effectiveness, willingness to participate, and awareness of the problems (Kim, et al., 2012). According to the personal norm, Erikson, et al., (2006) explained that there was a positive relation of the presence of the problems awareness with the willingness to reduce the car usage. Besides the personal norm, revenues allocation alternatives was also viewed as the opportunity to increase public acceptance. Ubbels & Verhoef (2006) in their study concluded that the general budget types tended to raise public refusal while the transportation improvement oriented types tended to raise higher.
3. Research Design

3.1. The Concept of TDM Strategies Combination

TDM strategies have the ability to solve the urban transportation problems which depend on the problems type itself, and independently has different function in solving transportation problems. This study promotes four type of strategies based on consideration of previous studies and some planning-related documents, and the strategies are (1) road pricing, (2) parking pricing, (3) alternative modes development, and (4) soft strategies.

Adopting the study by Thrope, et al. (2000), this study uses the concept of TDM combination strategies, which are later called as the packages of strategies. The eminences of combining the independent strategies are that each strategy will simultaneously achieve its own goals and support the others to achieve theirs. This make the independent strategy forms a mutual relationship one to each other. Combination strategies were also perceived as alternatives that could increase public acceptance to propose TDM strategies. However, by considering the characteristic of each TDM strategy, either the incentive or disincentive, some combination alternatives could be offered later this study.

Table 1. Combination of TDM Strategies

<table>
<thead>
<tr>
<th>The character of the strategy</th>
<th>Presumption Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy 1</td>
<td>Strategy 2</td>
</tr>
<tr>
<td>Incentive</td>
<td>Incentive</td>
</tr>
<tr>
<td>Incentive</td>
<td>Disincentive</td>
</tr>
<tr>
<td>Disincentive</td>
<td>Disincentive</td>
</tr>
</tbody>
</table>

Generally, the combination of two incentive strategies, as an alternative, were perceived as useful solution for community. However if they were perceived comprehensively, the type of this combination would not encourage itself to achieve its goals because there was the absence of the control to restrict the travels. Meanwhile, the combination of the disincentive strategies were assumed as the extreme action because it would restrict the travels. The assumption that the travel maker could determine alternative response for TDM implementation are the reason that make the strategies became acceptable. Litman (1999) explained that the combination strategies whose characteristic are complementary were the most
suitable strategies because it could optimize the function of the component strategies in it.

Based on the adaptation from previous studies and the consideration of urban transportation problems in Bandung, this study will propose 3 combination strategies: (1) strategy of Package 1 which consist of road pricing and mass transportation improvement strategy, (2) strategy of Package 2 which consist of parking pricing and mass transportation improvement strategy, and (3) strategy of Package 3, which consist road pricing and parking pricing strategy. In addition to that, in proposing the combination strategy, this study also use the consideration of the feasible mixture of incentive and disincentive strategies. Meanwhile, Thrope, et al. (2000) explained that in combining the TDM strategies, it was important to consider the reason of how the two or more strategies for being combined.

3.2. Research Approach

This study oriented on solving the urban transportation problem by using TDM strategies to intervene community motorized travel behaviour in order to decrease the demands for the provision of transportation infrastructures (Tamin, 1999). This study uses travel makers’ characteristic as variables that influence the strategies determination because each of the region has its own and unique transportation problems, which came from local travel behaviour, therefore they will need different strategies. Travel makers’ characteristics would determine the level of success of TDM implementation (Pontoh, et al., 2008) since it would influence public acceptance to the strategies itself. In addition to that, community cooperation to implement TDM strategies were an important factor in encouraging the successful of TDM implementation (Kitamura, et al., 1999). Thus, the TDM strategies should be able to accommodate the interest of travel makers. Through the general description about the group, some policies about TDM implementation which include their accommodation choices to response each group interest can be developed later.

In collecting the responses of travel makers’ preference in TDM acceptance and its probability to be chosen, some measurement tools are used, such as.

<table>
<thead>
<tr>
<th>Expected Response</th>
<th>Collecting Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance of TDM strategies</td>
<td>Likert scale (1-5)</td>
</tr>
<tr>
<td>Personal norm</td>
<td>Score (1-10)</td>
</tr>
<tr>
<td>Awareness to transportation urban problems</td>
<td>Score (1-10)</td>
</tr>
<tr>
<td>Public preference for marginal revenue allocation</td>
<td>Score (1-10)</td>
</tr>
<tr>
<td>Demand elasticity</td>
<td>Travel frequencies</td>
</tr>
<tr>
<td>Alternative of actions</td>
<td>Score (1-10)</td>
</tr>
</tbody>
</table>

This study use some measures to examine the level of influence of TDM implementation for community, such as the ability to pay and some other variables
that were measured by using The Likert scale. Response are then becoming the main part of the data input in building the general description about the travel makers’ activity, behaviour and the impacts of TDM implementation proposal. By considering that there presumably some people who will receive the disadvantages from TDM implementation, this study will try to develop some policies which are the accommodation alternatives the strategy can give and other recommendation that support this accommodation.

3.3. Analysis Methods

This study tries to answer the problems about the accommodation TDM strategies can offer to community by using the qualitative approach. Qualitative research is the systematic scientific research about the phenomenon along with its relations (Creswell, 1994). The aim of this approach is to find the relation between travel makers’ decisions in cooperating the TDM implementation with the alternative conditions. Later in this study, the aim of this study give strong consideration to determine the analysis method.

Generally, the analysis is consist of 3 major parts, such as (1) analysis of the level of public acceptance for TDM strategies implementation, (2) the influence of TDM strategies development based on several conditions of community response in participating on TDM strategies implementation, and (3) Soft strategies development as the support system to TDM strategies based on travel makers’ response.

In analysing the collection of data, this study uses the logistic regression, such as ordinal, multinomial, and binary logistic to explain the possibility of each attitude on public acceptance. In explaining the possibility of each attitude of acceptance, either agreement or disagreement, this study uses the ordinal logistic regression. In addition to that. This study uses multinomial logistic regression to explain the possibility to choose each strategy.

Besides using the logistic regression, this study will also use the elasticity demand analysis to explain the change of demand as an effect of the implementation of TDM strategies. The elasticity demand in this study is the arc elasticity which follows the formula below:

$$\eta = \frac{\Delta \log Q}{\Delta \log P} \text{ or } \eta = \frac{\Delta \log Q_2 - \Delta \log Q_1}{\Delta \log P_2 - \Delta \log P_1} \quad (1)$$

where:
- $\eta$ = elasticity value
- $P_1, P_2$ = level of price
- $Q_1, Q_2$ = level of quantities consumed

3.4. Data Collection Model
This study uses two type of data collection methods: (1) the primary methods for collecting the travel makers’ response, and (2) the secondary methods for collecting the addition information about the TDM implementation in Bandung. In supporting the primary collection data method, this study uses questioners and observation to collect the responses and gain some information about the actual transportation condition in city centre, especially the visual information. In supporting the secondary data collection method, this study review some planning document, such as Bandung City Site Plan in 2010-2031 and Bandung Transportation Plan.

The travel makers who use the private car and travel toward and around the Alun-Alun of Bandung are the respondents of this study. This study choose the car users because they gained more transportation problem experiences than others. By using the number of car parking consumption in Bandung, this study finally can estimate the total number of car unit who travel in city centre. Based on this insight, this study can use the Slovin sampling technic (Umar, 2004) and conclude that 100 car users are enough to infer the conclusion of TDM acceptance in city centre.

3.5. Data Summary

This study conduct the primary survey on 5 major roads in city centre of Bandung which experience mostly transportation problems. They are Asia Afrika, Otto Iskandardinata, Dewi Sartika, Kepatihan, and Dalem Kaum Street. To gain the balanced information, this study also conduct the primary survey in both peak-time period and off-peak-time period and weekday and weekend. The collection of data consist of some summarized information such as: (1) the proportion of male respondent (77%) is bigger than the female (23%), (2) the group with age ratio of 30-39 and 40-49 get the biggest proportion (37% of each), (3) the group who earn more than IDR 5,000,000 get the biggest proportion, (4) the group whose travel origin is from Bandung and its surrounding get the biggest proportion, (5) the group with the occupation as entrepreneur get the biggest proportion (30%), (6) the group with level of education is bachelor degree get the biggest proportion (41%), the group which the aim of travel is individual and family shopping get the biggest proportion (50%), (7) the group with the range of time travel is 30 minutes – 1 hour get the biggest proportion (59%), (8) the group with frequency of travel toward and around city centre is 1-4 in a month get the biggest proportion (57%), and (8) the reasons for travel makers of using car as transportation mode are mostly because they found convenience in it and the matter of habit (51%).

4. Analysis

4.1. Public acceptance to TDM strategies implementation

Public acceptance to TDM strategies implementation in this section refers to the car users’ interest to participate in implementing it. This study only analyse car users response to combination TDM strategies: (1) strategy of Package 1 which consist of road pricing and mass transportation improvement, (2) strategy of Package 2 which...
consist of parking pricing and mass transportation improvement, and (3) strategy of Package 3 which consist of road pricing and parking pricing.

Since strategy of Package 1 and Package 2 have the incentives type of strategy in them, they would raise public acceptance to their implementation. Previous analysis shows that by adding the incentive independent strategy to the disincentive strategy, there will be an increasing of acceptance level of this combination strategy. In contrast to that, the strategy of Package 3 shows a very low level of public acceptance because both of the component strategy in it are the disincentive type of strategy.

Figure 1. Level of Acceptance to Independent TDM Strategies

Figure 2. Level of Acceptance to Combination TDM Strategies
Figure 1 shows that even the road pricing and parking pricing are the disincentive type of strategies, the probability of acceptance are bigger than refusal for them independently. As the only strategy with incentive type, the mass transportation improvement absolutely raises the biggest acceptance. By comparing the result from figure 1 and figure 2, we can see that the incentive-disincentive combination strategies tend to raise big probability of public acceptance than the double disincentives type do. By knowing that the incentive dependent strategy raises a big probability of acceptance, later this strategy become a very reliable tools to increase the acceptance of the disincentive strategies. Furthermore, this study use 3 types of respondents characteristics to measure public acceptance, namely social, economy, and travel behaviour characteristics, such as gender (x1), age (x2), level of income (x3), travel origin location (x4), the expenditure for car fuel in a month (x5), occupation (x6), level of education (x7), the aim of travel (x8), time travel (x9), the reason of using car as the travel mode (x10), travel frequency to city centre (x11).

4.1.1 Level of public acceptance based on travel makers characteristics

In forming the formula of public attitude to accept the TDM strategies, not all the characteristics give significant influence to each of strategy acceptance. For instance, levels of income (x3) and the reason of using car as the travel mode (x10) significantly influence public acceptance to Package 1 strategy, levels of income (x3) significantly influences the public acceptance to Package 2 strategy, and gender (x1), travel origin location (x4), and the aim of travel (x8) significantly influence public acceptance to Package 3 strategy. The results of the probability of public acceptance to TDM strategies show that the level of acceptance to Package 1 and Package 2 strategy are relatively high than the Package 3 strategy gets. We can conclude the relation of this results to the type of strategies in them, where the combination strategy with incentive type of strategy in it will raise higher public acceptance that the combination strategy with only disincentive type of strategy in it.

4.1.2 Level of public acceptance based on personal norm

Besides the car users’ characteristics, the personal norms do influence public acceptance to TDM strategies, such as the value of fairness (n1), equity (n2), freedom infringement (n3), perception of strategy’s effectiveness (n4), personal interest to reduce his/her car uses (n5), and personal perception on public interest to reduce the uses (n6). The equations of public acceptance to TDM strategies based on personal norm shows that not all the variable of personal norm give significant contribution in influencing public acceptance to TDM strategies. The equations show that the value of fairness (n1) and equity (n2) significantly influence public acceptance to Package 1 strategy, personal interest to reduce his/her car uses (n5) significantly influences public acceptance to Package 3 strategy, while there are no variable which significantly influence public acceptance to Package 2 strategy. By the end of analysis, the level of public acceptance to Package 1 strategy are higher than the Package 3 strategy.
4.2. Public choice to TDM strategies

As the mass transportation improvement strategy raises the highest public acceptance, it is obvious that this strategy are becoming a very useful tool to encourage car users to accept the strategy of Package 1 and Package 2, which make the strategy of Package 3 become more weaker. Following the previous proposition, in this section the analysis can present the equation of the probability to choose the TDM strategies:

\[ y_1 = -0.790 + 0.829x \]
\[ y_2 = -2.107 + 0.998x \]

(2)
(3)

Where:
y_1 = the utility of Package 1 strategy
y_2 = the utility of Package 2 strategy
x = level of income

The equations above present the formula of probability to choose the TDM strategies, which make the strategy of Package 3 as the reference base. The results of probability estimation show that the probability of car users to choose Package 1 strategy is 64.13%, where the probability for Package 2 strategy is 23.87% and the probability to choose Package 3 strategy is 12%.

Other insight form the equation above is that the level of income (x) is the only variable who significantly influence public interest to choose the TDM strategy. As the value of this variable is positive, we can conclude that the higher car users earn the higher their influence in determining the probability to choose the TDM strategy. This condition makes the car users with lower income, especially the group who earn less than IDR 1,000,000 have the smallest influence, and later by reviewing the odds value, they are the group who have potential to change their attitude of choice so this disturbs the probability to choose Package 1 strategy. Specifically, the potential of this group to change their decision from choosing Package 1 strategy to Package 3 strategy is 2.441 than to refuse it and 2.714 from choosing Package 2 strategy to Package 3 strategy.

4.3. The role of transportation problem awareness and revenue allocation in affecting public acceptance to TDM strategies implementation

Beside car users’ characteristics, transportation problem awareness and revenue allocation are 2 other factors who empirically influence public acceptance to TDM strategies. The summary of data shows that car users who travel towards and around city centre of Bandung perceive mostly that traffic congestion is the major problem that give influence to their travels. Other than traffic congestion, the problem of insufficient of parking space and the inconvenience of road use are other factors they perceive give influence to their travels. By the summary of the analysis of the probability to choose the strategy, the problem of parking space insufficiency, traffic
noises, and the inconvenience of road use are 3 variables who influence public decision to choose the 3 strategies. Both awareness of traffic noises and road use inconvenience significantly increase the probability of public to choose Package 1 strategy, while the awareness of parking space insufficiency do the reverse. In the case of strategy acceptance, contrasty, the awareness of parking space insufficiency increase public acceptance to Package 1 strategy and so do the awareness of road use inconvenience.

In revenue allocation case, the summary of data shows that mostly car users agree with the allocation of revenue to improve the mass transportation services, to improve the transportation system, and to improve or build new road. The results of analysis show that only the alternative of allocation for general fund that significantly influence the probability of car users to choose the strategy, specifically it decreases the probability of car users to choose Package 1 strategy. In contrast to that, the analysis of public acceptance shows that the alternative of revenue allocation to improve mass transportation services increases car users’ acceptance to Package 1 strategy.

4.4. The effectiveness of TDM strategies in decreasing the motorized travels

The effectiveness of TDM strategies in this section refers to strategies ability to decrease the motorized travels in and around the city centre of Bandung. To do so, this study use the demand elasticity analysis.

![Demand Elasticity of Package 1 Strategy Proposal](image)

*Figure 3. Demand Elasticity of Package 1 Strategy Proposal
Source: Analysis, 2013*

The equations above show that the elasticity unit is 0.445. It shows that the increasing of toll price at 10% will decrease the demand at 4.45%. Even though the pricing alternatives can decrease the travel demand rate, it is still not significant. The equations that present demand elasticity of Package 2 strategy proposal also show
that elasticity unit of this strategy is also not significant. In contrast to that, the demand elasticity of Package 3 strategy proposal shows the significance of its elasticity unit (0.520). This can be true based on the fact that the characteristic of the component strategy inside this strategy are useful only in decreasing the travel demand.

As the income level \((x)\) contribute to determine the level of public acceptance and probability to choose Package 1 strategy, there is a need of a consideration to measure the demand elasticity of this strategy in separate group. By doing that, generally, the demand elasticity unit of each sub-group are raising become much bigger. The results of analysis show that group who earn less than IDR 1,000,000 get the biggest elasticity unit while the group who earn more than IDR 5,000,000 get the lowest elasticity unit, but it is still significant. This results specifically show that the car users who earn less than IDR 1,000,000 are vulnerable to loss their travels. In addition to this interpretation, these people also do not have any sensitive price, which is important in considering their position relative to other earners. By reviewing back that the personal norm that significantly increases car users’ acceptance to Package 1 strategy is the fairness value, so the offer of general toll price at IDR 6,000 in off-peak period and IDR 12,000 in peak period is reasonable.

4.5. Soft strategies and further development in supporting TDM strategies implementation

Overall, the strategy of Package 1 are the strongest strategy based on the probability of car users to accept and choose it. Even though this strategy is the strongest, it also has some weakness to overcome with, which is the amount of car users who have interest to choose and accept other strategy higher than the Package 1 strategy, the alternatives which are able to accommodate the people who receive the disadvantages, and so on. The car users who earn less than IDR 1,000,000 are the common target group who need that accommodation, based on their position to TDM implementation proposal. Other separated-survey shows that in responding to TDM implementation proposal mostly car users are voluntarily do ridesharing and mode-shifting to mass transportation. Based on this facts, it is a relief then that the strategy of Package 1 already have that exact same strategy in it. In addition to that, the revenue allocation analysis also support this solution, which the allocation to improve mass transportation services increases car users’ acceptance to this strategy.

Besides analysing the hard strategies, this study briefly analysing the soft strategy. Based on some results of previous analysis, there are some solution that only can reach its goals by conducting the soft strategy only. Dissemination of information by training and education is one of soft strategy that supported the Package 1 strategy. The information of transportation problems, especially the traffic congestion and parking space insufficiency, and the revenue allocation to improve mass transportation services are the most important information that can support the Package 1 strategy. Beside information dissemination, there are also some need to arrange some policies related to TDM implementation, especially Package 1 strategy and empower actors to ensure that they can implement the strategy.
Table 3. Comparison of the Combination TDM Strategies

<table>
<thead>
<tr>
<th>Rating</th>
<th>Package 1</th>
<th>Package 2</th>
<th>Package 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chosen</td>
<td>64,13%</td>
<td>23,87%</td>
<td>12,00%</td>
</tr>
<tr>
<td>Accepted</td>
<td>76,98%</td>
<td>77,42%</td>
<td>13,11%</td>
</tr>
<tr>
<td>Doubted</td>
<td>21,97%</td>
<td>20,48%</td>
<td>35,72%</td>
</tr>
<tr>
<td>Refused</td>
<td>1,06%</td>
<td>2,10%</td>
<td>50,48%</td>
</tr>
<tr>
<td>Variable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Odds</td>
<td>2,441</td>
<td>2,714</td>
<td>reference</td>
</tr>
<tr>
<td>Elasticity unit</td>
<td>-0,445</td>
<td>-0,331</td>
<td>-0,520</td>
</tr>
<tr>
<td>Biggest elasticity</td>
<td>-1,20</td>
<td>-0,78</td>
<td>-1,03</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>20%</td>
<td>27%</td>
<td>18%</td>
</tr>
</tbody>
</table>

5. Conclusion

TDM as demand approach is now a common solution to solve the urban transportation problems. By intervening community behaviour on how they make their travel, what mode they choose, and so on, these strategies are able to decrease public demand to make travel, especially the motorized travel in and around the city centre of Bandung. TDM also works in a very specific way, so it depends on each urban transportation problem. In succeeding the TDM implementation, there is also a need to consider the main factors of TDM successes, such as public acceptance and strategies effectiveness.

This study shows that car users in and around the city centre of Bandung tend to accept the proposal of TDM implementation. The acceptance level of the incentives type is higher than the disincentives. When it comes to the combination form, the incentive strategy tend to have the ability to increase the disincentives acceptance, so the new combination strategy can decrease travel demands as well as provide some alternative to manage the travel loss.

By considering the probability of car users’ to accept and choose the strategies, this study conclude that strategy of Package 1 is the strongest strategy of all therefore it is a favourable choice to implement this strategy in the city centre of Bandung. Becoming the strongest strategy in other side raise consideration to optimize its performance by accommodate the car users who receive the disadvantages of the implementation. As the target group of accommodation, car users who earn less than IDR 1,000,000 in a month are vulnerable to disturb the Package 1 probability, but the presence of mass transportation in it later become a potential asset, not only to accommodate those people, but also help itself to raise public acceptance and probability to be chosen by car users. Dissemination of information, by promote the issue of transportation problems, such as traffic congestion and parking space insufficiency and revenue allocation are also useful to support the achievement of this strategy goals.
Until this day, The Government of Bandung are in the phase of planning the TDM strategies. Regarding to this, there is an expectation for this government to fully support the realization of the implementation, at least to make it supported by some related local regulations. Implementing the strategy in phase are preferable because it gives time to car users to adapt with the strategy implementation.

Other thing that play an important role to the implementation of The Package 1 strategy is the consideration of all actors’ involvement that related to this, such as transportation-related organization, CSOs, academicians, and the business owner in The City Centre of Bandung. To do so, there is a need of actors’ coordination, from the planning to evaluation process, in order to make this strategy comprehensively helpful by considering each actor position to this strategy proposal and future impacts.

Acknowledgement

First and foremost, the writer wish to thank all the rest of committee who supported this study. Also thank you to Debby Rahmi, Husen Wiratomo, M. Ikhwan, M. Zulhidar, and Rama Aimansyah who have been amazing help throughout undertaking activity of data collection in Alun-Alun of Bandung. This study represents a part of research study titled “Community Life Impact towards Incentive and Disincentive Policies” which was financed by ITB.

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VOLUME 2
INFRASTRUCTURE AND POVERTY ALLEVIATION
LEARNING FROM PADANG PARIAMAN REGENCY IN REDUCING POVERTY AND ESCAPING FROM DISADVANTAGED REGION THROUGH RURAL INFRASTRUCTURES

Teguh WIDODO

Abstract

After earthquake 30th September 2009, Padang Pariaman Regency faced many problems in restructuring its region including economics sector. Because of it, Padang Pariaman is categorized as one of disadvantage region. Percentage of poor people had increased after it. It was from 9% in 2008 to 12, 41% in 2009. Many infrastructures collapsed such as school buildings, roads, houses etc. By financial limitation, Padang Pariaman has been trying to rise up since the disaster. Some strategies have been applied for reducing poverty and developing the region to escape from disadvantaged region. One of the strategies was to develop rural infrastructures that trigger local economic such as irrigation, production road, opening a new road etc.

The result of the strategies is poverty in Padang Pariaman to be decreased significantly. Based on BPS data 2012, percentage of poverty in Padang Pariaman was to be 11, 26% of total population. PDRB based on current price was 6.978,94 billion in 2011 and 6.270,94 billion in 2010. The growth was 5,49% in 2011.

This paper aims to describe how Padang Pariaman escape from disadvantaged region and alleviate the poverty. This paper is divided by three parts. Firstly, describing condition of poverty and the region Padang Pariaman after earthquake. Second part explains how the strategies applied including how important infrastructures support the poverty reduction. The last part explains the impact of rural infrastructure in reducing poverty and escaping from disadvantaged region.

Keywords: Poverty, disadvantage region, rural infrastructures

1. Background

After earthquake 30th September 2009, Padang Pariaman Regency faced many problems in restructuring its region including economic sector. Because of it, Padang Pariaman is categorized as one of disadvantaged region. Percentage of poor people had increased after it. It was from 9% in 2008 to 12, 41% in 2009. Many infrastructures collapsed such as school buildings, roads, houses etc. By financial limitation, Padang Pariaman has been trying to rise up since the disaster. Some strategies have been applied for reducing poverty and developing the region to escape from disadvantaged region. One of the strategies was developing rural infrastructures that trigger local economics such as irrigation, production road, opening a new road etc.

1 Study Program: State Administration Science Sekolah Tinggi Ilmu Administrasi (BNM) Pariaman
Poverty and disadvantaged region are two conditions closed each other if they are reviewed overall. Poverty may be as a disadvantaged region if it is viewed macro and the community members living in under disadvantaged region are mostly under poverty line. They are underprivileged that happened not because of poor will, but it is condition that may not be avoided by their capacity. Shubik and Levitan (1980) define poverty as material and serving shortage needed to achieve standard of living. According to Suparlan (1993), poverty is life under living standard such as lack of material in a number of people compared of common life in the concerned community. Friedman (1979) also explains poverty as a different opportunity to get social power including assets of land, home, health, financial support (proper revenue and credit) socio-politics organisation that used together to achieve public interest; social network to get job, material and services, proper knowledge and skill; and useful information. Some poverty terms can be summarized both process and causes from their inability interaction between individual and their environment in fullfilling live.

Inability of personal interaction with own’s environment may be not only caused by individual inability but also caused by other factors such as geographic, disaster that always endanger; lack of infrastructures access, therefore the community members may not interact with their environment well. Those conditional factors are called development barriers or it may be called disadvantaged. It may be happened by many people in one region so that it is called disadvantaged region.

State Minister for Acceleration Development Disadvantaged Regions is more refer to disadvantagedness as an under development region caused by some factors such as: (1) geographically unsupported, unaccessable both communication and transportation (2) Limited natural resources (3) its minimum of infrastructures (4) limited human resources (5) Isolated region, conflict-prone and disaster.

Context of Padang Pariaman as a disadvantaged region that its most inhabitants live under standard is because of it had gotten natural disaster many times both earthquake and flood. This regency suffered from flood in 2000, earthquake in 2005 and the worst earthquake happened in 2009. It caused some districts collapsed.

Padang Pariaman Government has tried to rise up after earthquake starting the end of Regent Muslim Kasim Era and changed by Regent Ali Mukhni. Local government has been very intensive lobbying mega projects to the central government. Finally, poverty and disadvantaged region are significantly decreased. Revival begins from the limitation both of budgeting and human resources as subjects of development. Potency of settled foreigners is the firstly reviewed by local government especially to them who have important position in a central government. Tradition potency is the second. Traditions that strongly sticking are badoncek (giving fund of money for public facilities) and gotong-royong (work together for public infrastructures).

This paper tries to more explain how the Padang Pariaman government rises up and strives to reduce poverty and to escape from disadvantaged region. This paper is divided by three parts. Firstly, it portraits of poverty and disadvantaged region in
Padang Pariaman Regency. Second part explains strategy of reducing poverty and the last explains of impact felt from that infrastructures.

A. **Portrait of Poverty and Disadvantaged in Padang Pariaman From 2009-2012**

Poverty condition in Padang Pariaman Regency based on National Survey in 2011 was 44,633 people or 11,26% of total population 397,062 inhabitants. This condition is more decreased than after earthquake in 2009 and 2010. Indeed, this condition is better than national poverty but it is still worse than provincial poverty reduction that has achieved 8% in 2011. However, poverty condition in Padang Pariaman compared three years ago points out a progress trend significantly. Padang Pariaman can reduce the poor people approximately 2000 people or 400 households. This can be shown in a below table.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>392,941</td>
<td>393,571</td>
<td>397,062</td>
</tr>
<tr>
<td>2</td>
<td>48,764</td>
<td>46,677</td>
<td>44,633</td>
</tr>
<tr>
<td>3</td>
<td>12,41%</td>
<td>11,86%</td>
<td>11,26%</td>
</tr>
</tbody>
</table>

Source: analysed Susenas

Comparing with other regions in West Sumatera (see Graph 1), Padang Pariaman actually is not the best practice, but one thing must be learned is that Padang Pariaman tried some alternatives in limited budget. Therefore, in this paper tries to explain how Padang Pariaman Regency struggles reducing poverty.

From that table can be seen that poverty reduction about 2000 people per year or 400 poor household.

![Figure 1: Percentage of Poverty in Padang Pariaman Regency compared with National and West Sumatera](image-url)
Based on table and figure 1, it is very clear that Padang Pariaman Regency had reduced poor people around 0.38% per year. Then, if it see in table 2, it can be analysed that target reducing poverty in Padang Pariaman is still under target compared with other regions in West Sumatera.

Table 2. Target Reducing Poverty in Padang Pariaman Regency Compared with West Sumatera

<table>
<thead>
<tr>
<th>NO</th>
<th>Regency/City</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2009-2010</th>
<th>2010-2011</th>
<th>Approximately</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Kep. Mentawai</td>
<td>20.54</td>
<td>19.77</td>
<td>18.85</td>
<td>-0.77</td>
<td>-0.92</td>
<td>-0.56</td>
</tr>
<tr>
<td>02</td>
<td>Pesisir Selatan</td>
<td>10.56</td>
<td>10.22</td>
<td>9.75</td>
<td>-0.34</td>
<td>-0.47</td>
<td>-0.27</td>
</tr>
<tr>
<td>03</td>
<td>Solok</td>
<td>12.15</td>
<td>11.74</td>
<td>11.19</td>
<td>-0.41</td>
<td>-0.55</td>
<td>-0.32</td>
</tr>
<tr>
<td>04</td>
<td>Sijunjung</td>
<td>9.80</td>
<td>10.45</td>
<td>9.94</td>
<td>0.65</td>
<td>-0.51</td>
<td>0.05</td>
</tr>
<tr>
<td>05</td>
<td>Tanah Datar</td>
<td>6.93</td>
<td>6.90</td>
<td>6.57</td>
<td>-0.03</td>
<td>-0.33</td>
<td>-0.12</td>
</tr>
<tr>
<td>06</td>
<td>Padang Pariaman</td>
<td>12.41</td>
<td>11.86</td>
<td>11.26</td>
<td>-0.55</td>
<td>-0.60</td>
<td>-0.38</td>
</tr>
<tr>
<td>07</td>
<td>Agam</td>
<td>9.86</td>
<td>9.85</td>
<td>9.39</td>
<td>-0.01</td>
<td>-0.46</td>
<td>-0.16</td>
</tr>
<tr>
<td>08</td>
<td>Lima Puluh Kota</td>
<td>9.98</td>
<td>10.48</td>
<td>9.96</td>
<td>0.50</td>
<td>-0.52</td>
<td>-0.01</td>
</tr>
<tr>
<td>09</td>
<td>Pasaman</td>
<td>12.47</td>
<td>10.97</td>
<td>10.42</td>
<td>-1.50</td>
<td>-0.55</td>
<td>-0.68</td>
</tr>
<tr>
<td>10</td>
<td>Solok Selatan</td>
<td>11.66</td>
<td>11.11</td>
<td>10.61</td>
<td>-0.55</td>
<td>-0.50</td>
<td>-0.35</td>
</tr>
<tr>
<td>11</td>
<td>Dharmasraya</td>
<td>11.40</td>
<td>10.57</td>
<td>10.09</td>
<td>-0.83</td>
<td>-0.48</td>
<td>-0.44</td>
</tr>
<tr>
<td>12</td>
<td>Pasaman Barat</td>
<td>9.61</td>
<td>9.59</td>
<td>9.14</td>
<td>-0.02</td>
<td>-0.45</td>
<td>-0.16</td>
</tr>
<tr>
<td>71</td>
<td>Padang</td>
<td>5.72</td>
<td>6.31</td>
<td>6.02</td>
<td>0.59</td>
<td>-0.29</td>
<td>0.10</td>
</tr>
<tr>
<td>72</td>
<td>Solok</td>
<td>6.76</td>
<td>7.00</td>
<td>6.72</td>
<td>0.24</td>
<td>-0.28</td>
<td>-0.01</td>
</tr>
<tr>
<td>73</td>
<td>Sawahlunto</td>
<td>2.42</td>
<td>2.48</td>
<td>2.34</td>
<td>0.06</td>
<td>-0.14</td>
<td>-0.03</td>
</tr>
<tr>
<td>74</td>
<td>Padang Panjang</td>
<td>7.58</td>
<td>7.59</td>
<td>7.25</td>
<td>0.01</td>
<td>-0.34</td>
<td>-0.11</td>
</tr>
<tr>
<td>75</td>
<td>Bukittinggi</td>
<td>6.19</td>
<td>6.82</td>
<td>6.49</td>
<td>0.63</td>
<td>-0.33</td>
<td>0.10</td>
</tr>
<tr>
<td>76</td>
<td>Payakumbuh</td>
<td>10.15</td>
<td>10.58</td>
<td>10.09</td>
<td>0.43</td>
<td>-0.49</td>
<td>-0.02</td>
</tr>
<tr>
<td>77</td>
<td>Pariaman</td>
<td>5.48</td>
<td>5.90</td>
<td>5.66</td>
<td>0.42</td>
<td>-0.24</td>
<td>-0.06</td>
</tr>
</tbody>
</table>

| 13 | Sumatera Barat| 9.54 | 9.50  | 9.04  | -0.04     | -0.46     | -0.17         |

Source: Bappeda of West Sumatera 2012

Disadvantaged region in Padang Pariaman can be explained like this: Padang Pariaman has 60 Nagari (Villages) and 445 Korong (smaller than village). There are 26 villages categorized disadvantaged region, while there are 184 korong categorized disadvantaged regions or 41.34% of total 445 korong in Padang Pariaman. Other conditions provised Center of Statistic Board are 15 lists of disadvantaged regions. But the majority of them are caused by:

a. Main roads are still land construction
b. Medical services are still taken over by nurses instead of doctor.
c. Water for daily use is still used rain water.
d. The majority house holds are still dominated by farming.
e. Difficulty to get health services access
f. Socio-economic condition is still poor.
Table 3. Disadvantaged Region Both Nagari and Korong in Padang Pariaman Regency

<table>
<thead>
<tr>
<th>No</th>
<th>District</th>
<th>Disadvantaged Village</th>
<th>Disadvantaged Korong</th>
<th>Advantaged Korong</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Batang Anai</td>
<td>1</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>Lubuk Alung</td>
<td>2</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>Sintuk Toboh Gadang</td>
<td>0</td>
<td>5</td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td>Ulakan Tapakis</td>
<td>0</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>Nan Sabaris</td>
<td>0</td>
<td>12</td>
<td>27</td>
</tr>
<tr>
<td>6</td>
<td>2 x 11 Enam Lingkung</td>
<td>1</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>7</td>
<td>Enam Lingkung</td>
<td>1</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>8</td>
<td>2 x 11 Kayu Tanam</td>
<td>2</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>9</td>
<td>VII Koto Sungai Sarik</td>
<td>0</td>
<td>7</td>
<td>35</td>
</tr>
<tr>
<td>10</td>
<td>Patamuan</td>
<td>3</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td>Padang Sago</td>
<td>2</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>12</td>
<td>V Koto Kampung Dalam</td>
<td>1</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>13</td>
<td>V Koto Timur</td>
<td>3</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>Sungai Limau</td>
<td>2</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>15</td>
<td>Batang Gasan</td>
<td>2</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>Sungai Geringging</td>
<td>4</td>
<td>22</td>
<td>6</td>
</tr>
<tr>
<td>17</td>
<td>IV Koto Aur Malintang</td>
<td>2</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>Total Amount</td>
<td>26</td>
<td>184</td>
<td>261</td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>43.33</td>
<td>41.34</td>
<td>58.63</td>
<td></td>
</tr>
</tbody>
</table>

B. Strategy Reducing Poverty and Escaping Disadvantaged Region

Economic indicators explaining whether the region development or under development are Gross Domestic Product (GDP) and Original Domestic Revenue (ODR). If we compare with other regions closed Padang Pariaman such as Bukittinggi, Pasaman and Agam therefore Padang Pariaman GDP is still low. The low GDP implies from low ODR so that programs Local development budget (APBD)-based is low as well. Then, this condition is addressed by Padang Pariaman government with trying to do strategy of development. There are two big strategies in Padang Pariaman due to reduce poverty and to escape disadvantaged region namely APBD-Based and non APBBD-based.

APBD-Based Strategy

Its reduced poverty in Padang Pariaman is not escaped from government performance involvement. This performance is primarily related to involvement of leading sectors (SKPD) prioritize poverty alleviation programs.

Programs done each SKPD in current year is categorized by three part programs namely (1) Program to increase farmer’s purchasing power such as integrated farmer prosperity; developing rural economics institutions; Coastal community economics
empowerment and developing aquaculture. (2) Health and prosperity improvement programs such as social services and rehabilitation; Societal Nutritious Improvement; Elderly Nutritious Improvement Program (3) Program for Enhancing Education such as scholarship started from elementary school to university. (4) Supporting program for infrastructures in order to facilitate the society accessing economics, educational and health services. In 2013, Padang Pariaman Local government allocates budget about Rp. 32.16 Billion for alleviating poverty and escaping region from disadvantaged. Detailed on that each supporting programs is as below.

Table 4. Budget Allocation for Poverty Alleviation and Escaping Bacward Region in Padang Pariaman 2013

<table>
<thead>
<tr>
<th>No</th>
<th>Local Institution</th>
<th>Program</th>
<th>Budget (Rp) (000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Agriculture and Plantation Department</td>
<td>1. Integrated program For Farmer Prosperity</td>
<td>880,000</td>
</tr>
<tr>
<td>2</td>
<td>Social and Labour Department</td>
<td>2. Poor Empowerment Program; disadvantaged region escaping program and solving social problems.</td>
<td>200,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Service and Social Rehabilitation Program.</td>
<td>292,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Coaching Child Abuse Program.</td>
<td>45,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Labor Protection Program.</td>
<td>40,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Social Welfare Empowerment Program.</td>
<td>235,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7. Data collection to Social Problem</td>
<td>43,715</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8. Resettling inhabitants Program</td>
<td>20,000</td>
</tr>
<tr>
<td>3</td>
<td>Department of Community Empowerment and Family Planning</td>
<td>9. Rural Economics institution Development program</td>
<td>560,692,750</td>
</tr>
<tr>
<td>4</td>
<td>Public Work Department</td>
<td>10. Particular Allocation Fund</td>
<td>6,450,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11. Program of clean water by pipe networks and Program of managing waste</td>
<td>4,904,100</td>
</tr>
<tr>
<td>5</td>
<td>Health Department</td>
<td>12. Society Nutritious Improvement Program</td>
<td>191,500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13. Epidemic and endemic Diseases Prevention.</td>
<td>1,010,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14. Partnership in health services Program</td>
<td>10,405,151</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15. Aging Services Program</td>
<td>25,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16. Improvement program for Infant and</td>
<td>215,000</td>
</tr>
<tr>
<td>6</td>
<td>Asset and Finance Department</td>
<td>17 Fund program for improper settlement</td>
<td>191,500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18. Scholarship program for junior and senior high school student.</td>
<td>1,010,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19. Housing Improvement Program</td>
<td>300,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20. Scholarship program for elementary student</td>
<td>1,000,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21. societal clean water fund program</td>
<td>500,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22. university student fund</td>
<td>1,771,200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>23. farmer empowerment Program</td>
<td>741,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24. Food Security Program</td>
<td>500,000</td>
</tr>
<tr>
<td>7</td>
<td>Department of Agricultural Extension</td>
<td>25. Economic empowerment program for Fisherman</td>
<td>365,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>26. Fishery Cultivation</td>
<td>490,000</td>
</tr>
<tr>
<td>8</td>
<td>Fishery and Marine Department</td>
<td>27. Electricity Development</td>
<td>580,000</td>
</tr>
<tr>
<td>9</td>
<td>Cooperation and Trading Department</td>
<td>28. Social and Culture Planning</td>
<td>60,000</td>
</tr>
<tr>
<td>10</td>
<td>Local Government Planning and Development Board</td>
<td>Total Amount</td>
<td>32,164,358,750</td>
</tr>
</tbody>
</table>

Source: Padang Pariaman Development Budgetting 2013
The based on reality, poverty Alleviation program can be quickly generated by other strategic methods such as:

**a. Actual assessment on poverty and disadvantaged Region**

1. Identifying center of poverty and advantaged regions
2. Identifying majority causes of poverty and advantaged regions.
3. Identifying severity of poverty and disadvantaged region.
4. Identifying depth of poverty and disadvantaged region.

Actual assessment on poverty and disadvantaged regions aim to describe condition of poverty and disadvantaged region by identifying of alleviate to poverty.

**b. Formulating steps of Alleviating Poverty and Disadvantaged Region**

![Diagram of steps of Alleviating Poverty and Disadvantaged Region]

- Data of Social Protection Program
- BPS survey
- Data of disadvantaged Regions

**Steps of Alleviating Poverty and Disadvantaged Region**

1. Implementing poverty and Disadvantaged Region alleviation Programs
2. Facts of Poverty
3. Description of poverty and disadvantaged Region
4. Community Strategy in Alleviating Poverty and Disadvantaged Region
5. Poverty and Disadvantaged Region Alleviation
6. Action plan for Each Leading sectors (SKPD)
C. Poverty and Disadvantaged Region Alleviation

There are four biggest factors that influence of poverty alleviation such as:

1. Enhancement of human resources through education and vocational training:
   a. Increasing literacy rate
   b. Increasing length of school rate trough packet A, B and C
   c. Increasing social vocational in entrepreneurship.
2. Enhancement of local economics entrepreneurship
   a. Increasing community entrepreneurship appropriate with basic capability.
   b. Seeking new alternatives for community income.
   c. Seeking local commodities marketing
3. Enhancement of community health through :
   a. Health Promotion such as improving poor family nutrition.
   b. Health Insurance both local and national program (Jamkesmas and Jamkesda)
4. Infrastructures Support for socio-economic accessibility through:
   a. Developing production line.
   b. Rehabilitating Irrigation network.
   c. Developing Clean Water Network.
   d. Developing electricity and telecommunication network.

d. Action Plan for Alleviating Poverty and Disadvantaged Region

![Figure1: Steps of Alleviating Poverty Action Plan](image-url)
Non Local Government Budgeting Strategy of Alleviating Poverty and Disadvantaged Region

Limited Local Government Budget had made Local government developed its creativity to remain alleviating poverty and escaping its region from disadvantaged. The breakthroughs that very strategic were:

1. Developing infrastructures through working together in the community (Gotong-royong) periodically. It is done starting from community’s land handover for public facilities then continued by social mobilization to Gotong royong such as building street, irrigation or other public facilities. The leading sector institution in this context is empowerment of woman and family planning Board. Object of the gotong royong is to open access to main road, to rehabilitate irrigation network and to clean neighborhood environment.

2. Developing human resources to alleviate poverty through collecting alms, infaq and benefaction that organized by Padang Pariaman Alms and Benefaction Board. This activity is done by cut Muslim government officer’s salary. Alm is collected through weekly Religious Activity. The distribution of this fund is for poor university student, temporary fund for poor medical treatment and disable person.

3. Fundraising National budget sources that is gotten from leading sectors proposal such as done by transportation agency, social agency, and others. Its impact seen that trillion rupiah budget flows to Padang Pariaman regency for many projects. Its implication is surely to value added and to velocity money in Padang Pariaman will be bigger and this may be as an economic thrust in the future.

C. Closing Remarks
Accelerating development in local government after autonomous is very dependent on the potency had regency/city and regent in creating fundraising. Not all regencies have strategic location for to be developed. There are regencies that difficult to be developed because of natural factors. But that limitation doesn’t close regent’s the creativity for fundraising to develop its region. Padang Pariaman regency is categorized an advantaged region and its citizen are mostly categorized live under poverty line. Even alleviating poverty in Padang Pariaman is not as fast as other regions, but in one thing is necessary to be replicated when the region mainly has limited budget. Creativity in seeking fund is a strategic breakthrough in alleviating poverty.
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Bappeda Kab. Padang Pariaman.


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EVALUATION OF URBAN AND RURAL BENEFIT IN KIND PROGRAMS FOR POVERTY REDUCTION IN URBAN AND RURAL AREAS

SURJONO, Fauzul Rizal SUTIKNO

Abstract

One of the big challenges of national development in Indonesia is to reduce poverty. As population tends to grow in urban areas, then attempts to fight against poverty will focus on urban areas. This research looked at the case of urban–PNPM in Malang to evaluate urban poverty reduction program, while for rural areas, Pragaan Daja Village – Sumenep Regency was taken as a case. The purpose of this study is to evaluate the effectiveness of urban PNPM program in Malang; to evaluate the root causes of persistent poverty in Pragaan Daja Village; and to formulate factors that should be considered in the future poverty reduction programs. Root causes analyses through community’s perception, using focus group discussion (FGD) and participatory Rapid Appraisal (PRA), were employed in this research. The research found that physical development-related programs, such as road, public toilet and sewerage projects, were less successful in alleviating poverty. Factors that should be considered to run more effective urban poverty programs are improvement of institutional, community involvement, management and technical aspects, while for rural areas focus should be given to sources of rural community’s income, economic infrastructure, agricultural development and education.

Keywords: Poverty Reduction Program, urban poverty, rural poverty, FGD, PRA.

1. Introduction

Indonesia is a very large archipelago that consists of hundreds of populated islands, which than isolation may become a key issue of the causes of poverty. There is a growing body of knowledge on spatial poverty and isolation (Bird, McKay, & Shinyekwa, 2010; Amarasinghe, Samad, & Anputhas, 2005; Kanbur & Venables, 2005). However, much of the literature has focused on the government’s policies related to infrastructure development and other physical isolation (remoteness). The other perspective, as promoted by Sen perceives isolation as the incapability to access sources that are important to human welfare. Therefore, isolation can mean remoteness or and lack of capability to improve their wellbeing.

It is important to understand the characteristics of poverty in different spatial location. Due to spatial differences, urban and rural poverty are uniquely distinctive. Urban poverty is often related to lack of access to land, water and sanitation, while rural poverty is often related to lack of access to irrigation and road. Programs and projects need to be targeted to the causes of poverty in urban and rural areas. This study compared poverty and programs related to poverty reduction in urban area
(Malang) and rural area (PragaanDaja Village – Sumenep Regency). The issue of poverty on both areas were examined, based on perception of the poor /the targeted community.

Two areas were chosen for the case study. The case study in Malang was located in Klojen District, the highest density district in Malang (11,944 people/sqkm). We looked at sub-districts that are targeted for Community Empowerment National Program (PNPM). PNPM is one of national programs that is aimed to reduce poverty. There were three sub programs to be evaluated: infrastructure, health and economy. The significance of this program can be evaluated from the benefits of the program that are perceived by the community. It can be compared the impact before and after the implementation. We took Pragaan Daja Village for the case of rural poverty area. Pragaan Daja Village is a unique village where the main occupation of the villagers are begging, full-timely or part-timely. Begging is their intergenerational profession. The Local Government of Sumenep Regency is currently paying more attention to this problem, otherwise the existence of beggar village will be an indicator of failure in eradicating poverty in Sumenep Regency.

2. Methods

Due to the difference of characteristics concerning location, community’s level of education and cultural constraints, we used different method in evaluating urban and rural poor. Evaluation of urban PNPM Mandiri was based on program evaluation method proposed by Dunn (2004). The evaluation was based on two criteria: effectiveness and efficiency. The criteria unit for efficiency was net benefit of the program (before and after the program) based on community perception (in IRD/month), then the scale of net benefit would show the effectiveness of the program. The benefit parameters were grouped into three: infrastructures; health; and economic activities (table 1).

<table>
<thead>
<tr>
<th>Program</th>
<th>Benefit Criteria</th>
<th>Projects</th>
<th>Benefit Parameter</th>
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<tbody>
<tr>
<td>Infrastructures</td>
<td>Road improvement;</td>
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<td>Transportation cost; business productivity; and economic opportunity</td>
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<td></td>
<td>Local drainage;</td>
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<td>Sanitation (public toilet);</td>
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<td>PNPM</td>
<td>Nutrition assistant /</td>
<td>Work labor productivity; human capital</td>
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<td>staple food aid and</td>
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<td>health aids;</td>
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<td>Housing improvement</td>
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<td>Physical building, mini library and scholarship</td>
<td>Human capital</td>
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<tr>
<td>Economic aids</td>
<td>Micro credit</td>
<td>Income, investment; and capital</td>
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The assessment of benefit was evaluated from an aggregation of benefit (in IRD) and Gini ratio (in percentage), therefore the benefit of each location (sub district) was converted into percentage. Criteria for inequality level (gini ratio) was grouped into three criteria: low, moderate, and high (table 2).

<table>
<thead>
<tr>
<th>Gini values</th>
<th>Inequality level</th>
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<tbody>
<tr>
<td>&lt; 0.4</td>
<td>low</td>
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<tr>
<td>0.4 - 0.5</td>
<td>moderate</td>
</tr>
<tr>
<td>&gt; 0.5</td>
<td>high</td>
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</table>

**Source:** Yuli (2009)

Rural poverty was assessed through focus group discussion (FGD) using participatory rural appraisal (PRA) to generate objective statements from rural community. From these tools, village history, village map, transect, daily life, institution, policy, and earning calendar can be elaborated to evaluate the failure of rural poverty reduction program in the village.

### 3. Results and Discussion

**Evaluation of urban poverty reduction (PNPM) program.**

Assessment of the benefit of the program (PNPM) to reduce urban poverty was based on the evaluation of performance of each project (7 projects as shown in table 1). The first step was to evaluate the benefit of each program based on community’s perception. The results (figure 1) showed that the benefit of each project in three sub-districts was different. In Klojen and Kasin sub-districts health aid and micro credit scheme were substantially support people capability equal to Rp 75,000 to Rp 95,000/month, while local road improvement provided benefit to the community in Kasin and Sukoharjo sub-districts which was equal to Rp. 53,000/month. Overall, the PNPM program provided benefit most to Kasin sub-district. Figure 1 also shows that benefits of the programs to the urban poor, in order, were provided by soft loan (micro credit scheme), local road improvement, health aid, education, sanitation, drainage, and lastly home renovation.

The second step was to analyze inequality level (gini ratio) of each program in each sub-district using inequality level shown in table 2. The inequality of each activity/program describes the effectiveness of the program. Figure 2 shows that the benefit of micro credit programs, local road, and drainage projects were not equally distributed in Klojen sub district, while the distribution of sanitation, health aids and education programs were relatively equal. In Kasin sub district, inequality was found in local road improvement programs and health aid programs, while in Sukoharjo sub district all programs were relatively equal (micro credit and health aid programs were not available in Sukoharjo).
From these two assessment, the benefit and gini coefficient, we measured the aggregate performance of the project in each sub district by adding the value of benefit (%) + value of gini coefficient (%) and calculated the average value. The results were categorized into Good - Fair - Poor. The performance is shown in figure 3. Four projects were successful (good category) in Kasin and two projects were successful in Klojen, while no project was successful in Sukoharjo.

The results of evaluation on PNPM Projects proved that the focus of urban poverty alleviation programs should be shifted from physical projects, such road and drainage projects, to health and financial aid programs. Physical projects were easy to implement, however the targeted households who gained benefit from the projects were not effective. Health and financial aid programs were more beneficial two poor families.

**Evaluation of rural poverty reduction program**
Pragaan Daja village represents common situation of under developed areas in Indonesia. Field observation and PRA analysis revealed several characteristics of Pragaan Daja Village:
The results of PRA are as follows:

1. **Village history;** the village did not have long history. The forest was cleared for settlement in 1971, since then it has grown to a village. An endemic attack this village in 2012 (malaria and respiratory infection).

2. **Village map;** Three main problems of the village were: the problem of land cultivation system (infertile and unirrigated field, 85.22% of the area) and infrastructures (unpaved roads); social – economic problem (60% of farmers are beggars, figure 4 shows their settlement); and poor education system and facilities.

3. **Village Transect;** the village had potential commodities, i.e., fan palm, chili and corn. Some of the community worked as carpenters and some other bred local bird (*mano lebhet*). However the commodities were not well cultivated due to water constraint/unavailability of irrigation and low level of skill / education.

4. **Daily lives;** Productive activities started from 07.00 am (unlike other farmers who started their activities from 05.00). Low motivation to cultivate village’s land since the economic gain from agriculture was low.

5. **Village’s institution;** The relationship between village’s governance and community was low. Village administration, BPD and LPMD had low contribution to the social-economic development of the rural community. while the relationship between population and village’s women organization (PKK) was stronger so that PKK may provide positive impacts on the population.

6. **Livelihood analysis;** local population (mostly farmers) who worked as beggars were living on arid farmland which no irrigation system. Education level was low. Income from farming (such as selling fan palm, about Rp 25,000 per day) was lower than begging (about Rp. 60,000 - Rp. 100,000 per day). The absence of local market and bad infrastructure worsen their livelihood.

Planning document (Regional Planning - RTRW 2011-2031 and Long Term Development Planning 2005-2025) analysis revealed that many policies stated in those documents were not operational and did not meet the actual condition of the village.
PRA analysis and field observation found that the root causes of the problem can be grouped into internal and external factors:

1. Internal factors: ‘profession’ as beggar provided more earning than farming and local cultural condition was permissive to ‘begging’ as an ‘accepted profession’. The second sub-factor was low building capacity of local institution and community for having no initiative to create local market for developing local economy. The third sub-factors were related to physical land that was hilly, infertile, and no irrigation system. The forth sub-factors were weak educational management to improve educational level of the community.

2. External factors: there are three main sub-factors. Firstly, the less formal attention from the government (local and provincial), reflected from irrelevant policies and programs that did not suit the need of local people. Secondly, no agricultural advocacy and support to local farmers so that agricultural commodities were not productive and could not escalate local economy. Thirdly, education cost was relatively expensive to village people, so that the poor could not afford formal education while informal education was poorly managed.

4. Conclusion
Poverty alleviation programs should be internalized into policies and planning which are specific to locality. Urban poverty and rural poverty have different characteristic, however, they have similarities in terms of targeting. Both need improvement on economic capability which should be supported by affordable well managed education system. Micro credits were relevant to urban community while for rural community job creation were more effective, since they had less initiative due to their low level of education. Physical projects may be relevant to urban and rural environment. Sanitation and home improvement were desired by urban community (Klojen District) while for rural community, developing better irrigation system was the priority in increasing agricultural productivity.

Reference


IMPROVEMENT OF THE FUNCTION AND ROLE OF POSYANDU (INTEGRATED SERVICES UNIT) TO DEVELOP THE COMMUNITY AT SLUM AREA.

Case Study of Posyandu “Bakti 75” Jebres, Solo

Budi SULISTYO 1)

Abstract

Pos Pelayanan Terpadu or Integrated Health Services Unit usually renown as Posyandu has been acknowledged by part of the community especially at suburban area as a health service unit that is always ready to serve them at all time. In general, Posyandu presents at each village or ward/kelurahan to serve the needs of local people for the health services.

In kelurahan Purwodiningratan, Kecamatan Jebres, Kota Solo, in which majority of the people have no permanent work, there are Posyandu Lely VI and Lely VII that serve the people’s health problem. However the both Posyandus do not work optimally. People in kelurahan Purwodiningratan, Jebres, Solo are yearning for Posyandu that can operate optimally to make safe and comfortable situation for them since their health problems and life amenities will be more maintained.

There is Alumni ITB generation 1975 who work together with their self-awareness to develop a Posyandu at kelurahan Purwodiningratan, Jebres, Solo to assist the community at the keluruhanan in their needs of health services. However, the Posyandu developed by Alumni ITB 75 is not the one that merely serves public health, it also serves Early-Childhood Education or Pendidikan Anak Usia Dini (PAUD); development of economic sector in the form of batik industry development, production and marketing of juadah (delicacy made from rice) and fish husbandry, and know-how to make batik. The Posyandu is named “Bakti 75”

The improvement of Posyandu function and role which is so big turns out to be creating prosperity improvement of public community surrounding the Posyandu, since they can learn how to develop themselves and make themselves more productive.

With the improvement of local community productivity, economic activities at the location are directly improved, and all people consciously feel the positive impact of the improvement of Posyandu “Bakti 75” role and function.

Keywords: Posyandu; Purwodiningratan; Jebres; Solo; Alumni ITB 75; Bakti 75; MDG’s.
Introduction

Ministry of Health Republic of Indonesia (2006) defines Pos Pelayanan Terpadu which is usually abbreviated as Posyandu as an institution for health maintenance organized by and for the community which is guided by related officers. It is expected that by the development of Posyandu in all remote area of Indonesia region, the health of all Indonesian people can be maintained by making the best use of nearest Posyandu within their area.

As for health standard service provided in general includes immunization; supplementation of high dose of vitamin A; distribution of contraception pills or condom; mild medication and also contraception consultancy. The health basic services provided by Posyandu are proven to be very needed by people in particular who live at both suburban and inland areas.

Posyandu is widely spread in all areas of Indonesia and in operational days of the Posyandu, people around the Posyandu come in groups to check their health or to consult with the Posyandu officers regarding their health problems.

The Purpose of Posyandu

In the development to maintain health of the surrounding people, each Posyandu has purposes among others:

- Lower baby mortality rate,
- Lower maternal mortality rate
- Improve the community participation to develop health activities and Contraception program
- To support the achievement of healthy and prosperous society

The purpose of Posyandu is aimed at the improvement and maintenance of public health level in general, and this is the main purpose of the Posyandu establishment. Therefore, the expectation that public health level around Posyandu can be improved after it routinely operates is not mere wishful thinking.

Posyandu Function and Role

In general, Posyandu is expected to be functioned as a medium for reproduction movement for prosperous family, a medium for family endurance movement, and also a medium for prosperous family economic movement. These are reflected from the activities of Posyandu itself when it actively operates.

- Growth Monitoring Card – Kartu Menuju Sehat (KMS) Filling
- Individual counseling based on the result of KMS filling
• Health service in the form of immunization which covers BCG, DPT, Polio and Hepatitis B; supplementation of high dose of vitamin A; distribution of free medicine and Contraception equipments; and Contraception consultancy.

Therefore, it can be described that Posyandu is playing an important role in directing, developing, guiding and maintaining public health in surrounding area.

Posyandu’s function and role that is very focused at people’s health makes a “positioning” that Posyandu is only as foremost institution that maintain and improve public health level.

**Posyandu in Kelurahan Purwodiningratan, Jebres, Solo**

Kelurahan Purwodiningratan, Solo, is one of the small wards in kota Solo that is connected with Solo city center. There is a small train station in this ward that is called Stasiun Jebres. The highway toward city center is Jalan Urip Sumohardjo which is a busy main street in Kota Solo.

![Figure 1 Three Level of The Product Posyandu Purwodiningratan Jebres, Solo (before 10 September 2012)](source: Result of Analysis October 2011)

It is a small ward with 4,031 number of population in 2010 and increased to 4,407 in 2012, with population density of 100 -150 persons/ha, even the most part of population is more than 150 persons/ha and inhabited by middle to lower class of community. There was 9.3 percent population growth during 2010 – 2012.
The majority of people in the ward work as labor or trader in slum, dark and unhealthy market of Purwodiningratan. There are many unemployed and people who work as porters around the station. Their income is relatively uncertain.

There is less clean water available and garbage is thrown onto a small river there and water drainage is also covered by garbage. Many of the waste water drainage covers are damaged or stolen. Unhealthy lifestyle is daily scene in crowded and dirty Kelurahan Purwodiningratan.

There are also Pos Lansia (Elderly Post), Early-Childhood Education Post – Pos Pendidikan Anak Usia Dini (PAUD), Contraception Service Post and Family Building Post in addition to Posyandu Lely VI and Lely VII in Kelurahan Purwodiningratan, Jebres, Solo which operate separately and with uncoordinated activities. Other than having non-permanent place, they have no standard services to become the guidance for undertaking services to the community.

It can be seen from figure 1 *Three Level of the Product* before 10 September 2012 that Posyandu Purwodiningratan, Jebres, Solo only had core products and tangible products. The existing tangible products were Posyandu Lely VI, Posyandu Lely VII, Pos Lansia, Pos PAUD and Contraception Services Post. Non permanent Posyandu location has made people felt uncomfortable with their health problems.

In short, the problems faced by Posyandu kelurahan Purwodiningratan, Jebres Solo can be classified as follows:

- There is no facility and infrastructure to implement Posyandu and other activities. The Posyandu activities are undertaken discursively according to existing situation and condition when the Posyandu and other activities operate.
- There is unsatisfactory capability of Posyandu volunteer which needs training and assistive worker.
- The condition of middle to lower class of society in Kelurahan Purwodiningratan, in particular who earn money from activities held in the area of train station in Jebres and also in the market which often put forward violence. It needs special efforts to handle.
- There is very weak and no optimum coordination and implementation of coaching from related parties at the field.

It can be seen that, based on the above outline, Kelurahan Purwodiningratan, Jebres, Solo, constitutes a settlement near the center of Kota Solo. However it is a crowded settlement with people from middle to lower class of community which needs careful, directed, and targeted handling. It shall be handled with improving the function of Posyandu at the ward.

The Interest and Expectation of People in Kelurahan Purwodiningratan, Solo

Based on comprehension and research that were undertaken upon the population regarding the expectation of people who live in Kelurahan Purwodiningratan, Jebres, Kota Solo, there are their thoughts that can be concluded as follows:
• They require better life than the one they are living now which covers both economic activities and health condition.
• They require work opportunity that provides better income based on the potency and skill they have.
• They want training and skill to be provided suit with their interest and talent.
• They require knowhow education and training for children and teenager so they can have better future.
• They require skill training for elderly people to make them still be productive to be able to help in improving their economic condition.

Based on the research undertaken in Kelurahan Purwodiningratan, Jebres, Solo, it can be formulated the direction for planning and action to improve the people’s social condition.

Development of Posyandu “Bakti 75”

Alumni ITB 75 tried to make real breakthrough by developing a posyandu in Kelurahan Purwodiningratan, Kecamatan Jebres, Solo. The reason of posyandu selection at the location is that the people’s situation and condition which need posyandu to maintain their neighborhood and health.

Alumni ITB 75 give the posyandu they built a name of Posyandu “Bakti 75”. They rent an old house with about 4,000m2 coverage belongs to PT. Kereta Api Indonesia, and renovated it to be used for Posyandu activities. Formal ceremony of the posyandu operation was held on 10 September 2012.

As for the background of the posyandu development can be explained as follows. After launching a book titled “MDG’s Sebentar Lagi, Dapatkah Kita Menghapus Kemiskinan di Dunia (MDG’s About to Come, Can We Erase Poverty in The World?)” on 7 July 2010, the alumni ITB generation 1975 tried to implement their understanding on the content of the book they have published. Posyandu “Bakti 75” was established based on an intention to be able to implement the objectives of Milenium Development Goals which is usually called as MDG’s.

The thoughts formulated by alumni ITB generation 1975 to develop Posyandu “Bakti 75” are directed toward three main things to fulfill expectation of the people in Kelurahan Purwodiningratan, Jebres, Solo. And the thoughts are:

• Health services which cover maternal and breastfeeding care, baby and toddler health and nutrient care and monitoring, diarrhea disease tackling.
• Education service which covers holistic and integrative Early-Childhood education.
• Public economic development which covers skill improvement and productive economic undertaking training such as batik making, catfish cultivation and other works.
It is expected that with the above mentioned three main programs other applied programs can be develop to fulfill the requirements of people in Kelurahan Purwodiningratan, Jebres, Solo.

**Improvement of Posyandu “Bakti 75” Function and Role**

Seeing the fact at the field that the existing posyandu and other activities have no permanent place for implementing the activities, alumni ITB 75 determined to build a posyandu with permanent location. To bring it into reality, the following actions shall be undertaken.

- Determination of Vision of Posyandu in Purwodiningratan, Jebres, kota Solo. And the determined Vision is **“Realization of Prime, Friendly, Autonomous, and Sustainable Posyandu”**.
- Development of posyandu that is integrated with permanent operational place with appropriate building and land that is wide enough to accommodate all determined activities.
- Development of Posyandu, Elderly Post, Pos PAUD, and Contraception Services Post, Toddler Family Building Post and Development of Center for Skill Training.

**Figure 2 Three Level of The Product**

*Posyandu Purwodiningratan Jebres, Solo (after 10 September 2012)*

Development of training program for posyandu volunteers in order to improve standard service capability for posyandu. It is expected that with provided training, the posyandu volunteers have appropriate skill and able to better serve the people of Purwodiningratan, Jebres, Kota Solo.

Outcomes of the above mentioned developments can be seen on figure 2 “Three Level of The Product” after 10 September 2012. The Posyandu Purwodiningratan Core Products overlaid by Tangible Products in the forms of Posyandu, Elderly Post, Toddler and Family Building Post, Center for Skill Training, Family Consulting Center, and Center for Children and Teenager Consultation.

The Tangible Products were then overlaid by Additional Products in the form of Family Consulting Room, Classroom, Training Room, Batiking Practice Room, Cookery Room, children Playground, and Catfish husbandry.

The real outcome of the actions undertaken by alumni ITB 75 resulted in a complete posyandu that fulfills most of the requirements of people in Kelurahan Purwodiningratan, Jebres, Solo. Housewives become more comfortable to check their pregnancy and toddler to Posyandu. Teenagers and unemployed can work due to skill training provided. Early children can do their activities more cheerful since they have a place to play. Elderly people are now calmer in their daily life since they have became more productive by developing Cookery activity and Catfish husbandry which can improve their economic condition.

There are positive impacts factually resulted from actions undertaken by Alumni ITB 75 felt by people in Kelurahan Purwodiningratan, Jebres, Kota Solo.

Closing

Posyandu represents frontline for the government of Indonesia in maintaining public health in villages and wards throughout Indonesia. Posyandu’s functions and roles become so crucial in particular in the regions that are difficult to reach by health facilities at urban areas or district.

Posyandu’s functions and roles in suburban areas are not limited to merely maintaining public health, but it is also demanded to be a change agent for people to improve their welfare, since, in general, suburban areas have more diverse problems compared with rural areas.

Improvement of posyandu’s functions and roles, especially in Kelurahan Purwodiningratan, Jebres, Kota Solo, provides alternatives for people to solve the problems they face, in particular with regard to health and welfare improvement. Uncertainty in facing the future due to uncertain income for unemployed people in Jebres Station and elderly people who are considered non-productive can be solved by improving existing posyandu’s functions and roles. Non-productive housewives due to their lack of skill can develop creative economic activities by participating in skill training activities. Children and toddler become healthier since posyandu can
operate without having to move location and is guided by volunteers with standard skills.

Thus, the improvement of posyandu’s functions and roles according to potency it has will be able to develop a slum area into health and beautiful region.

Reference

THE WAY OF THINKING IN NEGOTIATION DURING PPP PROJECT FOR CLEAN WATER IN INDONESIA
Case Study: Clean Water Project in Tangerang

Binsar NAIPOSPOS, Boy KOMBAITAN, Ibnu SYABRI, PRADONO

Abstract
The key success of how to get an agreement during PPP for clean water project is how to negotiate the differences among public versus private partner on some issues. One issues of negotiation is the way of thinking in negotiation which is could be defined as the way of cognitive adaptation among public and private partners. The way of thinking can be classified as decisive thinking, creative thinking, cautious thinking, practical thinking and analytical thinking. Actually each partners during negotiation in PPP project has an interest on how to solve the differences among them and should be negotiated in formal table to reach an agreement. The methods used to justify the way of thinking during negotiation is by Qualitative Descriptive Analysis (QDA) which is showing an index of adaptive negotiation between public and private partners. Findings of the research show that the public partner more adaptive and use the way of decisive thinking on negotiation in reaching an agreement while the private partner less adaptive and using the way of creative thinking on how to negotiate the economic and technical issues. Both public and private partner prefer to use the cautious thinking on how to negotiate the social and environmental issues.

Keywords: Infrastructure Planning, Public Private Partnership, Way of Thinking, Negotiation, Adaptive Index.

1. Introduction
Presidential Decree Number 56/2005 already changes three times to be Number 13/2010 and finally Number 56/2011 which is to regulate the Public private partnership scheme on how to maintain the Infrastructure Development Process in Indonesia. From about more than one hundred PPP prospective project to be listed in PPP Book since it initially announced in 2005 just only Tangerang Clean Water PPP Project finally reach an agreement. The very lengthy process of PPP project cynically adjusted by the conservatives project developer as the failure of PPP scheme in Indonesia. The changes of mindset from the traditional procurement mechanism to the open market procurement mechanism need to be reformed but nowadays are already lasting in more than one decade.

Great success from the Tangerang PPP Project overwhelmed all the infrastructure developer, starting from the engineering construction company, architect, building material, mechanical and electrical company up to the maintenance and operational
building services. How PPP project can get a success in Indonesia. The success of reaching an agreement among the public or kabupaten Tangerang district government and the private company of PT AETRA are belongs to the very lengthy process of lasting more than two years of negotiation.

Negotiation is a process of how to get an agreement within an differences among parties. There should be an adaptation of how all parties can changes an interest and criteria to make a negotiation reach an agreement. Adaptation is a process of changes from certain condition to another condition. There are three aspect of adaptive index of how to resolute the differences within organization according to Kenneth Robinowitz (2004) which are depend on the way of thinking, the way of how to work and the way of how to communicate. In this research we try to elaborate the way of how to think in negotiation during PPP project with case of Clean Water Project in Tangerang.

2. Problem
Reaching an agreement during negotiation can be a lengthy time and sometimes in some developed PPP countries need more than a decade to reach an agreement. All parties usually need endurance to pace the spirit of how to make partnership to be dealt with success. Its already six decade Indonesia has running the conventional procurement mechanism for infrastructure development in financing, designing, operating and maintenance for public facilities project. During the six decade the private are lullabied by the untouchable conventional procurement mechanism. Lengthy proses of PPP project came up caused by some sort of shortages during the procurement. Research finding shows that is how to find the fit of negotiation is one of the key point to have a success of PPP project in Indonesia.

3. PPP for Clean Water in Tangerang
During 2005 kabupaten Tangerang has reached the highest rank of an epidemic prone area for dysentery in Indonesia caused by the problems of sanitation which was one of them are the problem of clean water deficiencies. The head of kabupaten Tangerang district didn’t had enough local public expenditure to cope with the problem and had invited the private investor to solved the need for clean water project for five kecamatan (Cikupa, Balaraja, Pasar Kemis, Jayanti and Kragilan) in Tangerang district area. Under the very strong will to solve the problem the government settled down some local regulation or PERDA (Local Government Regulation) and pronounced the PPP Task Force for Tangerang Clean Water Project. Under the patronage of Ministry of Public Works who responsible for Clean Water Infrastructure and the Banten Provincial Government as an integrated inter local district authority government finally signed the first PPP Clean Water Tangerang Project on September 2011.

4. The Way of Thinking in Negotiation During PPP
We classified five the way of thinking for Negotiation on PPP Project in Indonesia which are (1) decisive thinking (2) creative thinking (3) cautious thinking (4) practical thinking (5) analytical thinking. The characteristic of decisive thinking are
forward moving, bottom line, and ready fire aim. Negotiation of using such decisive way of thinking usually have a very short time consuming which is because of the well knowledge and huge number of professional experiences in such competence and they usually making the very fast decision to make an agreement.

The characteristic of creative thinking are beyond the box, having orientation in change, ready flexible fire. Negotiation of using such creative way of thinking usually use a more time consuming negotiation because the orientation is how to find the new way of solution. If the problem rather difficult to resolute the time will be extended to the next phase of negotiation. The characteristic of cautious thinking are square box, immediate needs, ready careful fire. Negotiation of using such cautious way of thinking usually use a much time consuming negotiation because they always aware and cautious of the failure of the project.

The characteristic of practical thinking are beyond close the loop, circular and ready practical fire. Negotiation of using such practical way of thinking usually used just only on a short of time during negotiation because they usually think that the problem are practically can be solved with the simple way. In the practical way of thinking there is no problem to solve the differences with a very simple way. The characteristic of analytical thinking are inward moving, do it right, ready aim fire. Negotiation of using such analytical thinking are very time consuming negotiation because every simple problem could be very difficult problem.

5. Issues of Negotiation
We classified the negotiation issues as four classified issues such as the technical Issues, the economic issues, the social issues and the environmental issues. From such number of clean water issues found in Tangerang we can identified the main issues of negotiation are as follows:

- Negotiation of technical issues: how to find the technical solution for tapping the 9,000 liter per second source of water from 21 kilometer length of transmission pipe from Cisadane River.
- Negotiation of Economy Issues: how to find the structure of tariff and guideline standard for rate of return for the 25 years concession period.
- Negotiation of Social Issues: how to find the solution of prioritizing the lowest income brackets for clean water under their ability to pay.
- Negotiation of Environmental Issues: how to find the environmental standard for the water waste from the installation to the newest river.

From the sort of four negotiation issues, we analysis with the quantitative descriptive analysis (QDA) technics and methods. With QDA we find the score index of negotiation to show how the way of thinking in public party and the private company party both to negotiate by findings the solution toward reaching an agreement.
6. Quantitative Descriptive Analysis (QDA)
Research Design of using Quantitative Descriptive Analysis are using the sense of respondent participation in giving a score to certain degree for a such number of problems they face during the negotiation process. During the negotiation the respondent will be asked by minding them to give a score (1 to 5) from not agree to absolutely agree about the way of thinking they used during negotiation. The method are valid for the respondent who are involved and know the negotiation process clearly. By casting the problem the respondent will measure the adaptation index of the negotiation process for the purpose of interest of public side and for the purpose of interest of private side.

By finding the index of adaptation among public and private, we can find the type of negotiation they prefer to choose in related to find the agreement during negotiation process in Public Private Partnership project for clean water in Tangerang.

7. Results: Adaptive Negotiation in PPP Main Issues
The elaboration of findings of the four typical of adaptive negotiation on the way of thinking are as follows:

A. Adaptive Negotiation on Technical Issues
By running an interview during 2012-2013 towards the negotiation team as respondent we find the findings of how the way of thinking during the negotiation process influences the result of agreement between public and private company and reaching an win-win solution among them on technical issues by as follow:
1. Negotiating the technical issues on the public side are more decisive than the private partner with the score index 4.6. Decisive thinking for the public is needed because in making decision on how the source of water tapped from the Cisadane River should be strictly decisive and should be by the Government of Tangerang. This is the responsibility of the public not the Private of PT AETRA.
2. The private on the other side are more creative and cautious than public side because the key success of the project are on how creative and how cautious the private can run the business during the 25 years in the long term concession period. Negotiation Index of the private company are 4.3 and 4.62 which shows that all the negotiation team strongly agree with that conclusion.
3. Both side are on the same pattern in finding the best solution during negotiation by use the way of thinking in the practical approach. The way of practical approach in negotiation are way of how to make a very difficult and conflicting issues to became the very simple and collaborative issues.
4. We find that the government are very adaptive while the private side are a little bit adaptive in negotiating the technical issues. The governement are very adaptive to negotiate the technical issues because they can adapt and prefer to changes their interest, their criteria and their option to make both side come to a better solution for the partnership.
B. Adaptive Negotiation on Economic Issues
For the Economic Issues we can find that the public and the private partners used the pattern of way of thinking in negotiation as follow:

1. The private partner of PT AETRA are more decisive and Creative than government in negotiating the Economic Issues. Decisive and creative thinking for the private is needed because the key success of the business are how much money or capital expenditure of the project needed to initiate the infrastructure for the source of water tapped from the Cisadane River. This should be strictly decisive and creative and will be the responsibility of the PT AETRA during the 25 year concession period.
2. The public and the private side are both should be analitical and cautious in the way of thinking to negotiate the economic issues.
3. We find that the government are very adaptive than the private in negotiating the economic issues.
C. Adaptive Negotiation on Social Issues
Searching the way of thinking in negotiating the social issues on the PPP Project we get a findings as follow:
1. The government are using the way of thinking in more decisive, more analytical, more practical and more cautious on negotiating the social issues in which of how to negotiate the low income bracket people to reach an access to clean water in Tangerang.
2. On the other hand the creative thinking are still on position of private partner in negotiating the social issues. The private partner still should be creative in giving advice to government to give an explication and justification to social justice on clean water problem.
3. We find that the government and the private partners should be adaptive in negotiating the social issues.

D. Adaptive Negotiation on Environmental Issues
The way of thinking in adaptive negotiation on environmental issues are as follow:
1. The government were using the way of thinking in more decisive, more analytical, more practical and more cautious on negotiating the environmental issues to reach an agreement among them. The differences between public and private are in how to negotiate the regulation on environmental impact assessment to solve the problem of sludge water.
2. The private partner (PT AETRA) used the creative thinking to negotiate the environmental issues. Under such circumstances the private company should be creative to give some alternative technology to solve the problem. Some alternative technology proposed by the private to solve the problem of sludging technology for the water purification methods.
3. We find that both the government and the private partner should be adaptive in negotiating the environmental issues.
8. Negotiation Index for PPP Project
The negotiation research on how the way of thinking can influences the making of an agreement between government and private partner are not as a simple as what the researcher usually made a premise on the negotiation theory. The coincidence research shows that there were the other two influencing factors of adaptive negotiation beside the way of thinking in getting on agreement during negotiation such as the way of work and the way of communication. The current research shows that there are some parameter index can be used to identify the way of thinking on negotiation are as follow: the parameter of decisive thinking are (1) forward moving, (2) bottom line, (3) ready fire arm. The parameter of creative thinking in negotiation are (1) beyond the box (2) change (3) ready flexible fire. The parameter of cautious thinking in negotiation are (1) square box (2) immediate needs (3) ready careful fire. The parameter of practical thinking are (1) close the loop (2) circular (3) ready practical fire. The parameter of analytical thinking are (1) inward moving (2) do it right (3) ready aim fire. From such number or parameter being used to identify the negotiation index we produce the index as shown on the table.

The score of adaptive negotiation index on the way of thinking shows that the government or the public sector (the district of Tangerang) plays an important role during negotiation on social issues and environmental issues with score index 4.56 & 4.36. The private partner or PT AETRA plays an important role during negotiation on technical issues and economic issues with score index: 4.3 & 4.62. The negotiation team mostly agree that the government are should be very cautious to negotiate on social and on environmental issues. This is understandable reason related to the how very significant role it was for the government to make the partnership get a success. The government of Tangerang as the contracting agency representing the various costumer of clean water should have a responsibility to
represent their need to negotiate with private company or PT AETRA. The way of thinking on the government side in negotiation are should be win-win solution to make other stakeholder be happy with the partnership.

The score of adaptive negotiation index for the public sector also shows that there was no significant role for the government side to be creative in negotiation (score index: 2.3) which will be influencing the way of thinking in making an agreement with the private company. The more important thing for the public sector are to be cautious in negotiation (score index 4.6 & 5.0) and also has to be analytical (score index 4.6) to make an agreement during negotiation. From such number of phenomenon we identify some parameter index for the way of thinking in making an agreement on negotiation as table below.

<table>
<thead>
<tr>
<th>WAY OF THINKING</th>
<th>DECISIVE</th>
<th>CREATIVE</th>
<th>CAUTIOUS</th>
<th>PRACTICAL</th>
<th>ANALITICAL</th>
<th>SCORE INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Public</td>
<td>Private</td>
<td>Public</td>
<td>Private</td>
<td>Public</td>
<td>Private</td>
</tr>
<tr>
<td>TECHNICAL</td>
<td>4.6</td>
<td>3.3</td>
<td>2.3</td>
<td>4.6</td>
<td>3.3</td>
<td>4.3</td>
</tr>
<tr>
<td>ECONOMIC</td>
<td>3.6</td>
<td>5</td>
<td>2.3</td>
<td>4.6</td>
<td>4.6</td>
<td>4.6</td>
</tr>
<tr>
<td>SOCIAL</td>
<td>4.6</td>
<td>3</td>
<td>3.6</td>
<td>4.6</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>ENVIRONMENTAL</td>
<td>4.6</td>
<td>3.3</td>
<td>3</td>
<td>3.6</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

Notes: 1=Absolutely Not Agree  2=Not Agree  3=Agree-Not Agree  4=Agree  5=Absolutely Agree

**Conclusions:**

Negotiation on the scheme of Public Private Partnership for clean water in Tangerang are the intertwined of interest among public (the government of Tangerang District) and the private company (PT AETRA) aimed at reaching an agreement on technical, economic, social and environmental issues. The aim of research is to find the way of thinking within negotiation between public and private partner. The objective of research is to elaborate how the adaptive negotiation have a relationship with process of reaching an agreement. Public versus private have a different approach on finding solution to reach an agreement because there is some different pattern of the way of thinking. We use the negotiation index to justify the way of thinking within public and private in reaching agreement on technical, economic, social and environmental issues.

The government of Tangerang as public sector prefer to use the way of decisive thinking during negotiation on social and environmental issues, while the private partner or PT AETRA prefer to use the way of creative thinking to negotiate the technical and the economic issues. In the scheme of PPP for clean water in Tangerang we also find that the public sector are more adaptive than private partner during negotiation. From the research we conclude that the public and the private company has its respectively role during negotiation to reach an agreement.
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EVALUATION OF WALKABILITY ON PEDESTRIAN SIDEWALK IN BANDUNG\textsuperscript{1}

Widjaja MARTOKUSUMO\textsuperscript{2}, Hanson E. KUSUMA\textsuperscript{3}, Sally OCTAVIANA\textsuperscript{4}

Abstract

Presently Indonesian cities are experiencing the rapid pace of transformation and social changes. Obviously, the process of modernisation has direct impacts on social and environmental design issues in urban areas, including the life or lifelessness of public (urban) spaces. The latter depends very much on the quality of the spaces, and whether they are welcoming to likely users, to walk, stay, sit or otherwise enjoy the spaces. Pedestrian sidewalk, as part of almost-forgotten public space, will be the focus in this paper. Thus, in this case pedestrian sidewalk belongs to the important public open space that is needed special attention. Based upon an on-going research on walkability concept and its implementation in Bandung, this paper unveils the importance of public experience of pedestrian sidewalk. Since urban (public) spaces has been a melting pot for people of various cultural, economic and social backgrounds, thus urban places should provide an appropriate atmosphere and attraction. Sidewalk is not merely a matter of infrastructure, but rather it offers possibilities in creating social inclusion. Notwithstanding, how well the physical milieu supports the activities, and to what extent the stakeholders’ commitment towards better public open space, both of them will guarantee the success of creating vibrant pedestrian sidewalk as part of the urban environment.

Keywords: walkability, sidewalk, social inclusive space, planning and design, Bandung

1. Introduction: The Inclusive City

Presently Indonesian cities are experiencing the rapid pace of transformation and social changes. Obviously, the process of modernisation has direct impacts on social and environmental design issues in urban areas, including the life or lifelessness of public (urban) spaces. (Hall/Pfeiffer, 2000; Madanipour, 2000, Gehl, 2006, Müge Akkar Ercan, 2007) The latter depends very much on the quality of the spaces, and whether they are commensurately welcoming to likely users, to walk, stay, sit or otherwise experience the spaces.

In relation to the quality of public infrastructure design, especially the making of responsive urban spaces, architects, planner and urban designer have also the

\textsuperscript{1} This paper is written based upon an on-going research on Walkability of Bandung’s Public Open Space. The research is funded by the Higher Education Research Grant 2013 (RIK ITB 2013) and undertaken at the School of Architecture, Planning and Policy Development ITB. The research is also being developed into a PhD research by S. Oktaviana, and under supervision of W. Martokusumo and Hanson E. Kusuma.

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obligation, and they are able to make better use of space, energy and public investment. (Burkhardt, 2004) This can be achieved by placing building, different functions and nature not only close to each other, but also by meeting the planning and design standards’ requirements. In the context of sustainable urban life, this will promote walking, cycling public transit and foster urban community. (Aecom, 2010)

In response to the globalization and modernisation, concepts and perceptions regarding the creation of vibrant environment are inevitably required that would enrich us in the coming future with greater understanding and confidence. In line with this, supportive and responsive urban conditions must be provided to accept complexity, to encourage irrationality and to foster visual delight and creative innovation. (cf. Ipsen, 1999) Since pluralism, as an important aspect of urbanism, is now more and more inevitable, thus a kind of planning regulation and design guideline for public spaces is also unavoidably necessary to come up with both technical and non-technical problems (Lim, 1998).

Pedestrian sidewalk, as part of almost-forgotten public space, will be the focus in this paper. In this case, pedestrian sidewalk belongs to the important public open space that is needed special attention. This paper, as part of the on-going research, unveils the walkability of public open space in Bandung, especially the pedestrian sidewalk in the corridor of Jalan H. Juanda. This corridor is chosen, since it belongs to the important street corridors in Bandung in term of socio-economic and cultural activities. Through observation and focus group discussion the research conducted will give highlights of the current circumstances of the most significance urban infrastructure. This article provides the result of pre-evaluation of pedestrian way in Bandung, based on public perception. The research is supported by the Higher Education Research Grant (RIK ITB 2013).

2. Urban Realities of Bandung: Walkability and the Inclusiveness

As it is believed, there is a strong relationship between (urban) space and its people (Gehl, 1987; Carr et al., 1992; Madanipour, 2000; Carmona et al., 2003). There are several insights, in which social interaction can be constituted and mediated through (urban) space. In order to serve people better, there are some requirements regarding on responsive urban infrastructure that should be fulfilled. One of the important of urban infrastructures is pedestrian sidewalks, which are to some extent somewhat often overlooked. Many cases reveal such circumstances, in which this type of urban space is neglected despite of its significant role in serving human and public activities.

Carmona et al. (2003) unveils that, successful public spaces are generally characterized by the presence of people, in an often self-reinforcing process. Moreover, Carr et al. (1992) explains that public spaces perform as the places of relaxation, which provide people with relief from the stresses of daily life. In relation to this, four key attributes of successful places, i.e. comfort and image, access and
linkage, use and activity and sociability have been identified by the Project for Public Space (1999).

In terms of walkability and inclusiveness, thus urban space should properly provide and offer possibilities for variety of outdoor activities. In relation to that Gehl (1987) in his seminal work *The Life Between Buildings* indicated that there are three sort of outdoor activities, as follows:

a. *Necessary activities* include activities in which those involved are to greater or lesser degree required to take part. Generally, these activities take place throughout the year, under nearly all condition, and they are more or less independent of the exterior environment.

b. *Optional activities* stand for activities which take place only when the exterior conditions are supportive. The relationship between activities and physical planning is here particularly important, and mostly the activities are dependent on physical conditions of the exterior environment.

c. *Social activities* are all activities that depend on the presence of others in public spaces. These activities could also be termed “resultant” activities, because in nearly all instances they evolve from activities linked to other two activities categories. Thus, social activities take place spontaneously, as a direct consequence of people moving about and being in the same spaces. This implies that social activities are indirectly supported whenever necessary and optional activities are given better conditions in public spaces. Thus, optional and social activities are the important key in determining the quality of an urban space.

The city of Bandung (2,5 Mio. in 2011) has just celebrated its anniversary on 25 September 2013, and with the age of more than 200 years old, the capital city of West Java Province is still facing the rapid pace of urbanization and lack of (urban) infrastructure. Thus, providing appropriate urban infrastructure is one of the most challenging issues during the great period of urbanization, besides the improvement programs on socio-cultural and economic development.

In contrast to the fact that Jalan H. Juanda, or well-known as Jalan Dago, has been one of the prominent streets in Bandung. The existing urban infrastructure nowadays, especially the pedestrian sidewalks along the Jalan H. Juanda, to some degree do not meet the minimum requirements yet. In the last two decades the emerging commercials activities have led to physical changes and they have been followed by the increasing burden for the existing urban infrastructures and amenities. It is very often that such changes have never ever been properly addressed and anticipated, in terms of the supply of basic requirement for improving public spaces. Some parts of the sidewalks are either ill-treated, including increasing occupancy by permanent street hawkers or street vendors, privately occupied, or they have been overlooked for years. It seems that the quality of this (urban) public space has never ever been a priority during the period office of the previous mayor of Bandung. Physical improvements of this area were once implemented, but it has no more than beautification and less meaningful.
In recent years Jalan H. Juanda, from the intersection of Pasar Simpang to the intersection of Jalan Merdeka, has been dedicated as a car free area at every Sundays. During the car free day activity, the corridor between the Pasar Simpang’s intersection and Jalan Sulanjana’s intersection is closed for cars from 6 am until 12 pm. It is furthermore to find out that the existing open space, including the sidewalks and bicycle lane, along the main street has a serious lack of quality. Obviously, the process of modernization with its consequences has also direct impacts on social and environmental design issues in urban areas, including the life or lifelessness of public (urban) spaces. The latter depends very much on the quality of the spaces, and whether they are welcoming to likely users, to walk, stay, sit or otherwise enjoy the spaces. Thus, this relates to the basic question on the critical notion of walkability and the inclusiveness of infrastructure planning and design, raised in this article.

3. Methodology

To evaluate the walkability of pedestrian way or sidewalk in the city of Bandung, we select a street (jalan) which represents the main street of Bandung. The evaluation was carried out by observation and mapping. For this evaluation 20 respondents consisting of 6 regional civil servants and 14 graduate degree students of architecture and urban design were invited and divided into two groups. The first group was asked to walk through the pedestrian way of the Jalan H. Juanda, starting from the intersection of Jalan H. Juanda and Jalan Ganesha, heading north until at the front of the Darul Hikam School, crossed the street, and walked back again to the starting point. The second group was also asked to walk through a pedestrian way of the Jalan H. Juanda, starting from the same starting point as mentioned above, heading south until the intersection of Jalan H. Juanda and Jalan Riau (RE Martadinata), crossed the street, and walked back again to the starting point. While the groups were walking down the pedestrian sidewalk, the participants (respondents) were asked to take picture of three places or spots that are considered comfortable or attractive. They were also asked to mark the map with a circle to show the location of those 3 (three) places/spots. Furthermore, they were also asked to take picture of three places or spots, that they thought uncomfortable or unattractive. Following that, they also marked the map with the letter x to indicate the point of the 3 (three) places/spots. When the both groups were finished strolling down the pedestrian sidewalk, all respondents were gathered, and were requested to submit 6 (six) photos of the evaluation, and explain the reasons for the evaluation of each photo. Data obtained from the data collection are photos, text and maps.

Data in the form of photographs were analyzed by sorting. The step of the analysis is as follows:

1. All photos were printed in half of A4 size paper. All of the photos were placed on the table, and grouped by the contents' similarities.
2. Each group of photos was named according to its contents.
3. The number of images from each group was calculated and the results of the calculations were shown in histogram.
4. Analysis and Discussion

The discussion of this article is mainly based on the content analysis of photographs data. The analysis has revealed a number of insights on the quality of both pedestrian sidewalks along the Jalan H. Juanda. In general, the perception on walkability of both pedestrian sidewalks along the Jalan H. Juanda have been divided into two categories, i.e. comfortable (category A) and uncomfortable (category B). Furthermore, every sub-category consists of several attributes. The frequency of attributes can be grouped according to the number of the collected data. Thus, for the category A, there are several important attributes, such as good design, equipped infrastructure, spaciousness, interesting object, shadyspace and well-designed landscape. (Fig. 1a, 1b, 1c)

For category A, spaciousness (13), good design(12) and well-designed landscape (11), establish the first three dominant attributes among the other three attributes, which have less than 11 frequencies for each. Thus, the other attributes, such as equipped infrastructure (8), shadyspace (9) and interesting object (5), are considered less significant. (cf. diagram 1).

Diagram 1. Category of Comfortable and Attractive Places for Walk

In regard to the category A (comfortable and attractive) there are some spots at both the sidewalks of Jalan H. Juanda that are considered well designed and spacious. It deals mostly with the physical condition of the sidewalks and the landscaping of the open space along the street. This also includes the design of the sidewalk or pedestrian way, i.e. the physical quality of sidewalk (material and finishing, spacious, continuity etc.), the landscape elements (including trees, bushes, green area, etc.), and the utilities. At least, those places, also the sidewalks, have been perceived as pleasantly designed. Nevertheless, it is also necessary to observe that this circumstance, to some extent neither refers to a pleasantly looking nor the sidewalks have met properly the basic requirements, however, well-designed is here rather perceived that the sidewalks are generally considered simply accessible. In the reality, there are some spots yet, in which the pedestrian ways are not accessible or blocked, decaying or even dilapidated. The well-designed sidewalks are often found
in the frontage of hotels, guest houses and retail shops, which means that the sidewalks might have privately been maintained. Consequently, this resulted likely in various design solutions, which in most cases do not fit to the adjacent parts of sidewalk corridor.

The category B consists of several attributes, such as: security hazards, mis-use, safety hazards, damage, rule violation, private occupation on public space (POPS), dirtiness, discontinuity, affordability. Moreover, in the category B (uncomfortable) several important attributes such as: discontinuity (12), private’s occupancy (12) and safety hazards (10) are considered significant. (Fig. 2a, 2b, 2c) On the contrary, according to the participants the other attributes, i.e. damage (9), mis-use (5), dirtiness (3), rule violation (2), affordability (2) and security hazards (2) are considered less important.(cf. diagram 2)

![Diagram 2. Category of Uncomfortable and Unattractive Places for Walk (POPS = Private Occupancy on Public Spaces)](image)

Regarding the category B (uncomfortable and unattractive) there are many spots and areas at both the sidewalks of Jalan H. Juanda that are considered inaccessible (discontinuous) due to several conditions, as follows:

Despite of the physical condition of the sidewalks, the privatization of pedestrian sidewalk (POPS) and the public amenities (equiped infrastructure) along the street are considered as the significant cause. Discontinuity, POPS and safety hazards are furthermore related to the design of the sidewalk or pedestrian way, i.e. the physical quality of sidewalk (deficiency of standards and requirements etc.), the congested sidewalks in several spots, the design of landscape elements (trees, green area, etc.) that are in general poorly maintained, not to say neglected, and the position of utilities/equiped infrastructure (electric pole, lighting device, and other utility devices). Due to poor plan and design of infrastructure the location of utilities and equiped infrastructures often block the sidewalks and the bicycle lane abruptly.
Obviously, the sidewalks of the corridor are not yet met the requirements of universal design or barrier free design principles. This can clearly be observed at certain spots, where different height level of pedestrian way is found. It is often, that instead of ramp, stairs are still used to overcome the different height level of pedestrian sidewalks.

Other finding deals with the use of material for the surface of pedestrian ways, which indicate also the deficiency in term of barrier-free design. Several spots are either lacking of pavement or the materials are not durable, due to the use of either cheap material or improper finishing works. Despite the use of warning and guiding blocks, the implementation of the barrier-free design is general still absent. In short, the sidewalks have a significant deficiency of quality. In some areas, especially in the Pasar Simpang’s intersection, the sidewalks are not only narrowed, but they are likewise occupied by the street hawkers and street vendors or other commercial activities of the vendors of Pasar Simpang. Thus, in the reality, there are also some unpleasant spots, in which the pedestrian ways are insufficient lightened, which means that they are not accessible at night-time. The latter refers also to the notions of safety and security hazards. The problem of safety is also indicated by the presence of motorbikes on pedestrian ways. The motorists use the pedestrian ways, in case of traffic, and this can do harm for the safety of the pedestrians. This circumstance has also unveils the rule violation and mis-use, which have also been perceived during the evaluation process of walkability.

From this observation we can conclude that there is a strong relationship between the activities and the quality of space (sidewalk) itself. It should be borne in mind, that active and responsive public spaces that meet its requirements in term of walkability do not happen by coincidence (Gehl, 1987). Despite the apparent intangibility of the features such as, use and activity, comfort and image, access and linkage and sociability, good places can be planned, designed and created with predictable results. In relation to the basic design principles, a climatically responsive environment is often forgotten. The issue of comfort in terms of tropical imperatives will also be important. Some spots of the corridor are considered to have a pleasant ambience. Not only the physical dimension of the sidewalks, but the presence of well-designed landscape elements (trees, bushes, and green areas) play an important role in increasing the quality of urban space. Moreover, effective response to climatic conditions will certainly improve the quality of life, particularly in tropical regions. Nevertheless, the shady space, as observed, may lead to the improper use (mis-use) of public space and at certain time (at nights) are considered as uncomfortable. To some extent, the shady area has also negative impact for the existing plants, due to the absence of sunlight penetration. Thus, the four key attributes of successful places must be taken into account in the planning and design process of public spaces. (Project for Public Space, 1999)
Figure 1a. Mapping of comfortable part of the Sidewalk (1st corridor)

Figure 1b: Mapping of comfortable part of the sidewalk (2nd corridor)
Figure 1c: Mapping of comfortable part of the sidewalk (3rd corridor)

Figure 2a: Mapping of uncomfortable part of the sidewalk (1st corridor)
5. Concluding Remarks

Based on the evaluation of sidewalks of Jalan H. Juanda, Bandung, the paper has revealed the evaluation and mapping of the implementation of walkability concept. As observed, the sidewalk corridor is considered as comfortable and uncomfortable. The sidewalk is part of the important (urban) infrastructure that is often overlooked by the city manager. The experience of participant in strolling along the corridor, at both sidewalks, has indicated a significant absence of physical quality. Well-designed landscape, good design and spaciousness are perceived as the positive
notions on the implementation of the concept of walkability, while POPS, discontinuity and safety hazards are as the negative ones.

To support the conclusions drawn out in the substantial aspect of walkability, it is to confirm that the creation of enjoyable urban experience contributes to the protection of significant urban fabrics (places, buildings, infrastructure etc.), and promotes its sense of place as well. The engagement of improving the quality of public space takes the stand that the quality of pedestrian sidewalk will likewise influence the experience of public space. As argued, nowadays, the character of the most public life activities in the present urban areas put a high demand on the quality offered by public space. The consumption of public space has unlikely determined merely by the user, as the case Jalan H. Juanda unveils, it deals particularly with how well the physical milieu reinforces the functions and activities taking place there.

Acknowledgement

The authors would like to express their gratitude and appreciation to the participants of the Workshop of Walkability, held on 21 September 2013 in Bandung. Without their commitment and active engagement this research would be unlikely carried out.

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Project for Public Space, 1999.
THE INCLUSIVE CITY : WALKIBILITY CONCEPT OF URBAN SPACE FOR VISUAL IMPAIRMENT
Case Study: Dago Street

Sally OCTAVIANA¹, Widjaja MARTOKUSUMO²

Abstract
Public open space as social facility means democratic and responsible because its accessibility and barrier-free for all social groups including those who are differently-abled. Accessibility is a key aspect of urban design’s social dimension. Moreover, accessibility tends to have reduce social segregation and fragmentation that threatens the inclusion of space. Those spaces give equity if they could accomodate urban's activity and offers equitable space, despite of gender, age and socio-economic cultural background. People and government have not given equal accessibility and diffability - friendly infrastructure yet for those different ability. Walkable means that open public spaces are physically safe, easy, usefull and independent. At least, accessible environment requires three main principles, i.e convenient, comfortable, conspicuous and quality of environment that all support social interaction among users (convivial)( Kent Count Council, 2010). Farber in Crum (2001), describes architectural barrier for disable as physical attributes of buildings and facilities (Syracuse University 1979). Based on the on-going doctoral research, this paper will discuss the concept of walkability from the different social group especially those with visual impairment. A gap between walkability concept and empirical condition generating the lack of spatial quality. The goal is to evaluate between the gap of public open space condition and the need of visual impairment in sidewalk and plaza along Dago street. Regarding theoretical contribution, this paper deals with the knowledge of walkability concept of Bandung public open space from the point of view of visual impairment group. Data was collected by qualitative approach through observation of their behavior as public open space user and in-depth interview when they take a walk along Dago street which was based on their sight ability.

Keywords: walkable, urban space, visual impairment, Dago Street

1. Introduction

Open public spaces should be walkable according to its responsibility (Bentley, 1985), democracy and meaningness (Lynch, 1990). The kind of disabilities that limit mobility are those people with visual impairment and wheelchair user. Both of them have significance differences comparing the other disabled but in particular visual impairment has most limitation because of their lost of mental and perceptual modality (Pallasmaa, 2005). The open public space should have walkability concept that physically safe, easy, usefull and independent for all social groups. In fact, most of Bandung sidewalks is not well-design for all users. In early observation, Dago street has better characteristic than the other streets in Bandung city. The choosen

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segment is limited between Dipati Ukur street to Cikapayang street because that segment is more well-design than other segment. This paper is to evaluate the gap between walkability concept and the existing condition along Dago street from the point of view of visual impairment. Data is supported by documentation of their behavior in open public space and photos of many elements that become problems especially for mobility of visual impairment. In accessing open public space, visual impairment sometimes need each other or normal person so that is the reason why they are always grouping. Visual impairment is divided to totally blind and partially sighted. This partially sighted is known as low vision that varies dependently on the level of visual acuity and visual field. The selected participants in this paper are those with low vision. People interviewed are those low vision who still have visual cuity ranging from about 3 – 5 meters and 19 to 30 years old. Most of all have blurred vision but there is one visual impairment has both blurred and like-chimney vision. Different people of visual impairment use different ways to find their way to their destinations and only by their space viewed.

2. Theoretical

2.1. Inclusive Space: Accessibility and Walkability
According to Bentley, responsiveness means to be able to give choice for its users which consist of gender, elderly, children and those people with disabled. Democracy means that the open pulic space should be used and barrier – free by those people who have different class in social, economy, culture even different ability (Carr, 1992). Inclusive design as mentioned Burton is designing environment that as many people as possible can use, regardless of age or ability. Farber in Crum (2001) generally mentions architectural barrier for disabled as physical attributes of buildings and facilities which by their presence, absence or design unsafe condition and/or deter access and free mobility for the physically handicapped in and around buildings and facilities (Syracuse University 1979). People and space are related. Dear and Wolch in Carmona (1992) said that space could constitute, constrain and mediate social relation. As public facilities, open space should accomodate people’s social process in urban context. Equity values, democracy and varieties in using open space could be understood as spatial that give social fairness for urban people and reduce social segregation and fragmentation that threaten the inclusion of space (equitable space). Access relates with mobility which people have capacity to enter and use the space based on their interest. Every people in certain moment is pedestrian and the environment must have ability to accomodate their varieties of users. Basic needs for creating walkable environment consist 5 C:

1. Connected – the important consideration is needed for attractive destinations location and its rute has to designed or improved to give connection and help users straight to their destination, safe and easy.

2. Convenient – developing pedestrian network that become main priority in designing circulation line. They should connect to one another and crossings should be on pedestrian desire lines to minimize deviation.
3. Comfortable – route is designed to make a trip becoming a pleasure experience. The line must have good quality, safety and barrier-free by optimal width and slope.

4. Conspicuous – the line should give safety by improving natural surveillance, low speed and minimize anti-social behavior for pedestrian.

5. Convivial – the quality of pedestrian environment should give connection between human and its environment. The quality of the walking environment should be improved to enhance the way people feel about and interact with the local area and other people. This involves tackling issues such as litter and graffiti and by creating engaging and interesting public space through the use of materials, lighting and art. Convivial could be perceived as part from appreciation of aesthetic involving all senses in many kind of situation. These forms through aesthetic sensory can be translated in symbolic form. Perception is a complex process more than seeing and feeling a space. Itelson in Carmona (1992) identified 4 dimension in perception whereas cognitive (thinking, organize and keep information), affective (involve feeling that influencing perception against environment) interpretative (interpretation of information that comparing the memory of space before and after) and evaluative (value and preference and defining bad or worse).

Some of the variables that affect pedestrian comfort are as follows:
A. Physical comfort include the completeness of supporting activities such visitors:
   1. Slope, texture, width and length of ramp, elevation and dimension of sidewalk. Some point above should be designed ergonomic and low physical effort for visual impairment. This is important to support mobility of visual impairment daily activities in using open public space or incidental (sidewalks, parks, etc.)
   2. Safety edge
   3. Motive and texture flooring.
   4. Architectural wayfinding system as environmental information
   5. Landscape element such as shelter, street lamp, bench and trash can, vegetation
   6. Public toilet

Types and patterns of activities should relate to the use and management of public completeness. It means that street furniture element should support people's activities. For instances, those street furniture above must have the following criteria:
   1. Flexible and easy to understand visually impaired
   2. Communicative and efficient for sensor capabilities and visually impaired
   3. No interfere with the movement of visually impaired
   4. Integrated with the space environment.

B. Mixed Affordance means physically and cognitively physical comfort including:
   1. Climate : temperature, wind, rain, sun
   2. The position of the access road and pedestrian path
The differences in perception depend on age, gender, ethnic and lifestyle, the distance of neighborhood, physic, social and culture of the environment. Burton (2006) mentions 6 element influencing inclusiveness which are familiarity, legibility, distinctiveness, accessibility, comfort and safety. Some of the variables that affect pedestrian comfort from literature study are as follows:

A. Physical comfort include the completeness of supporting activities, physical condition of infrastructure such as sidewalk, street furniture etc
B. Mixed affordance
C. Perceptual affordance

Based on literature study, the walkability concept has many criteria such as physically safe, easy, useful and independent for all social groups. Safe means that visual impairment can walk through without harm and perception of risk of physical danger. The environment should be easy to learn and understand through visual cues symbolizing and communicating. A gap between walkability concept and empirical condition generating the lack of spatial quality. This gap makes uncertainty, inconvenience and perhaps danger for the users.

3. Analysis

Interviewed data is analysis by text data analysis according to each participant’s opinion. The collected data is grouped by specific categories into many kind of themes. One of themes discussed is about walkability concept of Dago street. Dago street was a historical settlement since colonial period. Dago area was originally a residential area. In recent decade, by the development of regional growth, there are many changes in the function of a neighborhood commercial areas such as trade and office functions. This area is dominated by the growth of factory outlets along the Dago and cafes so it causes the increasing of infrastructure needs such as car parking. Green open space area changed into pavement in order to accommodate cars parking beside sidewalk or on street. The implication is that the catchment area is also reduced due to the expansion of the area of pavement in most areas. The congestion is often happened everyday and caused by on-street parking along Dago street. During weekend and vacation, Dago become major tourist destination especially from outside area of Bandung. The congestion was inevitable so the car free day program was initiated to reduce the impact of congestion. Car free day program is held from 6 am until 11 noon, enlivened by a crowd of people and street vendors from Simpang Dago street to Cikapayang street and some of the building plaza is used for music performances staged event. The research area location is bounded from Simpang Dago segment to Cikapayang street segment that represented in picture 1 below:
Figure 1. Area of Study
Source: Local Planning Agency of Bandung Municipality, 2011

**Connected.** Commercial is considered to be the most attractive function for people such as shopping activities, leisure or culinaire. Dago street is identified as a historic district. Every weekend, many visitors come to Dago street especially factory outlet as their destination to go shopping and strolling. Sidewalk along the Dago street has been designed and improved better to accommodate pedestrian and bike users. Most attractive rute is bounded by Dayang Sumbi street to Cikapayang street. Car Free day program in every Sunday along this rute is held for attractive destinations location and its rute has to designed or improved to give connection and help users straight to their destination, safe and easy.

**Convenient.** Pedestrian network should be the main priority in designing convenient space. Generally the problem for pedestrian network is crossing between pedestrian desire and automobile lines. Control of crossing between vehicle traffic and pedestrian is well enough at some point by relatively gentle slopes. At this point,
high level differences and slope of the ground are significance implication. For visual impairment, another important problem is about the color between height differences of the floor ground. For example, at the time when a low vision was asked to explore Dago street, he almost fell due to the lack of color difference on a different floor height. Low vision requires full concentration as they explore public open space. Their focus is strongly influenced by the crowd of people or another noise of surrounding environment, they could be lost of consciousness due to the concentration of the split. At this moment, they will take a while to restore consciousness. Some infliction could cause traumatic experience so they do not dare to go out alone or feel wary.

Provision of circulation zones (pedestrian) crossing and stopping public transport are very important. The dimension of Dago sidewalk is about 1 -1.5 meters divided to bicycle lane and pedestrian path. The public transport system is quite available but dominated by private car. There is clarity in the arrangement and hierarchy of land use but the occupancy public area by private becoming main issue.

**Comfortable.** Principally the route of Dago street is designed for pleasure. The diversity of commercial function along the Dago street makes visitors easy to get what they need. The line must have good quality, safety and barrier-free by optimal width and slope. Some of the comfortable aspects discussed below are:

C. Physical comfort for supporting activities such visitors:

1. Slope, width and length of ramp. There are significance differences between Simpang Dago to Dago Park and Dago Park to Aceh street. The Sidewalk of Simpang Dago to Dago Park segment is generally quite well-designed. The pavement width is approximately 1-1.5 meters. The lane this segment is divided to pedestrian and bike paths. At certain place along the sidewalk, there are many holes and damage of the paving block that cause accidents for totally blind person or a few low vision.

2. Dimension of sidewalk. Some point above should be designed ergonomic and low physical effort for visual impairment. This is important to support mobility of visual impairment daily activities in using open public space or incidental (sidewalks, parks, etc.)

3. Safety edge in Dago sidewalk is greenery along the street by the range of width 1- 3 meter. Varieties of vegetation serve as shade, aesthetic and barrier between vehicle and pedestrian pathways.

4. Motive and texture flooring as environmental information. Sidewalk of Dago consists of bicycle or wheelchair user and pedestrian path with different texture but same color. At the congestion time, the sidewalk near light intersection is often used as motorcycle trajectory so that pedestrian rights have no place. Some visual impairment recognize that the row and varieties of trees in Dago are different typical with other stripes. They also recognize by its atmosphere.

5. Architectural wayfinding system. Wayfinding system relates to the elements used by people to determine and follow a path. They consist architectural, graphic, audible and tactile communication. The landscape elements such as
shelter, street lamp, bench and trash can or vegetation could become wayfinding elements for those visual impairment. Architectural element could mean signage system and certain landmark such as sculpture, building, or another element. Low vision still recognize these element by its color and shape. Generally, street furniture has dual function, for instance, trash as support element can be functioned as signage by its color. Graphic, audible and tactile communication are hard to find in the open public space in Bandung. If there is graphic sign, then main function is as a billboard and does not interfere with their movement. By definition, it is not communicative but as signage, it is flexible and easy to understand for low vision. Some front page of building use water element. For visual impairment, this is quite efficient and communicative for their sensor capabilities.

6. Public toilet: no public toilet is available even in Dago park.

D. Mixed Affordance means physically and cognitively physical comfort including:
1. Climate: the varieties of vegetation in Dago street is different from another streetline. The diversity of vegetation can reduce microclimate, give shade and filtrate from wind and sun.
2. The position of the access road and pedestrian path. Some crossing occurs at intersection between the vehicle lane and pedestrian lane on some roads that implicate a significant difference in height. These could effect an accident for those who have vision deficiencies.
3. Parking space: at some segment, the highway is used as on-street parking. Low vision generally prefer walking on the highway compared to the pavement then parking on street can interfere their movement.

Conspicuous. The line should give safety by improving natural surveillance, low speed and minimize anti-social behavior for pedestrian. The diversity of activities and function can create natural surveillance so that Dago street gives safety for visitors.

Convivial. Human and environment are connected each other. Physical affordance is not the only aspect to fulfill human need. There is another aspect should consider in designing open public space named perceptual affordance. In Carmona (1992) there are some aspect influenced this perceptual affordance: imageability, social and psychology comfort, territoriality and legibility. These aspect should improve the way people feel about and interact with human or its environment. The interesting public space in Dago street is achieved by the use of color, material and art of billboard, signpost of factory outlet or the shape of streetlamp. Convivial as appreciation of aesthetic involving all senses in many kind of situation such as using of water element.
Dago street has diversity of commercial activities including office, hotel, restaurant, cafe and factory outlet so Dago street is a very important economic path in the North Bandung. The diversity function of Dago street attracts many visitors. The users of Dago street in weekdays are mostly students and employees of some offices such bank and stores. On this event, the users of various social groups take place in car free day every Sunday morning. Not all visual impairment feel convenient in crowd of people. Most of them feel sometimes lost consciousness because of such noise or crowding of people. The quality of physical object at Dago street provide clear description by the using of bright colors. It establishes pattern and form a picture of the space. That is the reason why the environment should be responsive and meaningful so they feel welcome in the neighborhood. The most influential convenience factor for visual impairment is leafy and shady environment. They could not see the kind of plants but they can feel the temperature. The most influential factor in the inconvenience of a open public space is a difference in height especially with no significant texture, color and material. Another influential factor is the condition of the damaged sidewalks. Unsafe sidewalks of Dago are also caused by discontinuities and a hole in the pavement.

4. Conclusions

Principally, from Simpang Dago stripe to Cikapayang street is considered as more comfortable for visual impairment. Some consideration underlying the comfort factor is the continuous pavement condition, with no holes and utility systems that do not impede their movement. Adaptation process that occurs, makes them rely more tolerant so that the most influential factor for those low vision is the difference in color or texture on a different floor heights and discontinuities of the pavement.

References

WOMEN’S ONLINE COMMUNITIES SOCIAL RELATIONSHIP
ESTABLISHMENT AS AN IMPACT OF UTILIZING INFORMATION
AND COMMUNICATION INFRASTRUCTURE

Yudi BASUKI¹, Roos AKBAR², PRADONO³, Miming MIHARJA⁴

Abstract
The development of activities in cities worldwide that is currently happening rapidly in line with the development of technology has created a demand on an infrastructure in relation to fulfilling the information and communication needs. The development has resulted in changes in the definition of society to be network society. Within the network society, the communities’ social relationship pattern has changed from hierarchical to more flexible structure. Changes in communities’ social relationship pattern happen not only in the developed countries but also in the developing countries; therefore, symptoms of social relationship changes due to network society is spreading worldwide. This depends on the availability of information and communication technology that tends to be easier and cheaper. At first, the information and communication technology was believed to reduce human physical meetings or death of distance. The convenience of internet application makes it easy for people to establish online communities based on similar needs and interests. The established online communities can have a lot of or limited members. The online community types are also various. The existence of online communities can also last long or only in a short time. The activities of the online communities’ members can also be various; nevertheless, in general they would be information and knowledge exchange. Such convenience has also facilitated the women in actualizing themselves through women’s online communities. With their own uniqueness and distinctiveness, women establish communities that are in accordance with their similar interests and needs. In online communities, people can do activities without having to meet in person. It was initially believed that most matters can be done without having to meet in person. The purpose of this article is to explain the fulfillment of women’s online communities needs to prove whether physical meeting is still required. Descriptive analysis is used to explain the characteristic of women’s online communities with sample framework from two women’s communities: Emak Emak Blogger Community and Ibu Hamil.com Community.

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The result of the research shows that the phenomenon of women’s online communities is a form of flexible and non-hierarchical social relationship. This form of relationship needs virtual and real space in its community’s activities.

Keyword: Women’s online communities, social relationship, information and communication technology.

1. Introduction

The development of activities in cities worldwide is currently happening rapidly in line with the development of technology, especially related to information and communication that is known as the informational city (Castells, 1989). Such development has created a new paradigm in planning the city’s infrastructure that facilitates information flows and needs. Information and communication technology has become an absolute need to create information infrastructure in cities and region’s development, which was even felt a decade ago (Graham, 2001). The city planners have been suggested to anticipate the information needs that impact the city’s activity system and structure (Audirac, 2005).

In its development, the development of information and communication technology has resulted in changes in the definition of society to be network society (Gustavo, 2006). In network society, the communities’ social relationship pattern has changed from hierarchical to be more flexible structure, from physical (direct) introduction to be virtual introduction (no need to meet and relatively new). The communities social relationship pattern is no longer based on proximity of geographical distance. In addition, there is a change in the communities from directly (physically) connected to be virtually connected and establishing new social groups (Gamal, 2010; François, 2009; Hampton, 2007).

Figure 1. Changes in Communities Social Relationship Form

![Changes in Communities Social Relationship Form](Source: Francois, 2009)

Changes in communities’ social relationship pattern happen not only in the developed countries but also in the developing countries; therefore, symptoms of social relationship changes due to network society is spreading worldwide. This depends on the availability of information and communication technology that tends to be easier and cheaper.
At first, information and communication technology was believed to reduce human movement or death of distance (Cairncross, 1997). Some activities using information technology such as teleconference and tele-education have reduced human movement. In its development, this is not an absolute occurrence. This development has also changed the spatial concept from reality spatial to be virtual spatial (Francois, 2009). Space flows and time becomes relative (Castells, 2010). Virtual mobility and cyberspace access make it possible for people to be connected during a variety of activities in any time and place (Ohmori, 2006; Golob, 2001).

The information and communication technology has also made it possible for the women to show more existence. Many issues concerning gender equality have been facilitated by this technology. United Nations has even pioneered gender equality program of increasing women’s access to internet (UN, 2005. Gender Equality and Empowerment of Women Through ICT. Women 2000 and Beyond).

The use of information and communication technology in Indonesia begins to develop fast. This is shown by the fact that Indonesia becomes a very active internet application user. The number of Facebook users in Indonesia ranks the third biggest in the world after United States of America and England with the number of users of more than 26,000,000 people. Facebook is used not only for social activities but also for promoting innovation results through online shopping (Social Media World Forum Asia, 2010). Although the above number if compared to the number of population in Indonesia is still relatively small; however, the symptoms of information and communication technology use in the cities show development that is not small.

The convenience of internet application makes it easy for people to establish online communities based on similar needs and interests. The established online communities can have a lot of or limited members. The online community types are also various. The existence of online communities can also last long or only in a short time. The activities of the online communities’ members can also be various; nevertheless, in general they would be information and knowledge exchange. Within the relationship, people can establish new online communities based on their interests. The tendency of having Facebook, Twitter, mailing list shows that people are gathered in online groups that are not singular and are various in types.

The needs that encourage the establishment of online community are representatives from human’s self-actualization that is not enough by only fulfilling primary and secondary needs (Maslow in Williams, 1995). These online communities are highly diverse from old friendship to new, communities among similar activities or hobbies, up to communities triggered by certain activity such as contribution of disaster and others. Hummel & Lechner (2002) classify online communities into five, as follows: (1) gaming communities; (2) communities of interest; (3) consumer-to-consumer communities (C2C); (5) business-to-business communities (B2B)

The convenience of internet application has also facilitated the women in actualizing themselves through women’s online communities. With their own uniqueness and distinctiveness, women establish communities that are in accordance with their similar interests and needs. The established online communities can be exclusive, only consisting of female members such as bundagaul.com, the hijabers
community, or free such as emak emak blogger and ibu hamil.com communities. Within the communities, the women try to fulfill their needs either they are only regarding information, socialization, or buy/sell.

In online communities, people can do activities without having to meet in person. It was initially believed that most matters can be done without having to meet in person. In the development, human as social creature still needs physical meeting. The interaction process in the online communities can be a movement to have physical meeting involving decision making process. Such decision making is the output of cognitive thinking, which decides a person’s choice. In theory, human’s cognition can be assumed as an information process machine (Williams, 1995). The occurrence of physical meeting highly depends on information, necessity, and rationality of the doers in the online communities.

The implication of the decision making will decide when and where the physical meeting will be held. The physical meeting time can be regular (daily, weekly, or yearly) and irregular (anytime). The meeting place highly depends on the online communities’ preference that can be at places nowadays known as representative places such as meeting house, hotel, big restaurant and such, or simply at someone’s house, small restaurant, cafe, park, etc. The physical movement created can be local (in town) or regional even international (between countries) (Cattan, 2007; Zandvliet, 2005).

From the theoretical explanation, the questions to be addressed in this article are:
1. How is the characteristic of women’s online communities?
2. How is the social relationship form established from women’s online communities’ activities facilitated by information and communication infrastructure?
3. How is the space established as a forum of women’s online communities’ activities?

The purpose of this article is to explain the social relationship form established from the women’s online communities.

2. Discussion/analysis
To answer the research question, the discussion is focused more into the characteristic of each online community to recognize the activities as well as the members, the spread of the online communities members to prove that distance and physical geographic location are not limitations for online communities, to what extent the fulfillment of needs obtained from the online communities, and whether physical meeting is still necessary for the online communities members. The method used is descriptive analysis with sample framework of two women’s online communities (Emak Emak Blogger Community and Ibu Hamil.com Community). The samples taken are members of each community of 49 members from Emak Emak Blogger Community and 59 members of Ibu Hamil.com Community. As an indicator to decide whether these women’s online communities have social relationship form that is flexible and does not depend on geographical boundaries is by identifying the relationship process among the members (whether they know each
other or not) and the residential spread of the members (limited to certain geographical boundaries or not).

In Emak Blogger Group (Kumpulan Emak Blogger) or usually called KEB is an Indonesian women’s blogger community. The members consist of hundreds (there is no exact data on the number of members) of women blogger from various Indonesian blogger communities, either residing domestically or overseas. This community was established by Mira Sahid on 18 January 2012. The activities held by this community among others are sharing inspiration, information, motivation, and members’ work. This community also often holds offline meeting of the blogger community. In addition, the community’s activities can also be a company’s product launching and facilitating work offer from many parties. Members of this community are women with the youngest age of 19 and oldest of 45. The members’ professions also vary from housewife (53%), private employees (29%), entrepreneur (6%), student/university student (9%), and the remaining members are either not working yet/looking for work (3%).

Ibu Hamil.com Community is a group that discusses around pregnancy and parenting. This community was established in 2011 and has active members of 196 from the total member of 849 (data per March 2013). The activities held by this community are discussion on information around pregnancy and parenting, seminars, and product selling. The community members are women within age between 19 and 35 year with various professions from housewife (66%), private employee (32%), and the remaining members are either not working yet/looking for work (4%).

Members of these two online communities started when the communities appeared in the internet. At first, it was initiated by a person and small group who do not know each other, which later develops and increases the members due to accessing the communities’ portals. The members of these two communities spread in big and small cities in Indonesia. Most reside in metropolitan cities such as Jakarta (35%) and other big cities such as Bandung (18%), Semarang (8%), Yogyakarta (12%), Surabaya (18%), Medan (2%) and Makasar (2%). Few members spread in small cities such as Ciamis (2%), Kuningan (2%), Lampung (2%), Tulungagung (1%), Balikpapan (1%), Tarakan (1%), Jambi (1%), Padang (1%) and Nabire (1%). This shows that the communities social relationship is unaffected by distance and geographical location (Hampton, 2007). The communities social relationship is more into similarities in interests and needs of the members; therefore, the established relationship is flexible and not hierarchical (Francois, 2009). This is seen from the various location spread of the communities members and the process of increasing number of members.

These two communities have active members. This is shown in the frequency of members accessing their online community. Most members actively access their online community in the form of question and answer/looking for information every day (72% for Emak Emak Blogger Community and 84% for Ibu Hamil.com Community). Only a few members are not active (not within once a week) in utilizing the online communities (6% of each community). Other activities held by the communities are socialization and product selling, especially to Ibu Hamil.com Community.
One of the purposes why women become member of a women community is to fulfill their needs. In this case, the needs of information become the biggest need obtained from women’s online community. Information around women’s activities, which is pooled in blog, is the main activity for Emak Emak Blogger Community. Whereas for Ibu Hamil.com Community, information around pregnancy, doctors, and parenting are examples of information needed. Nevertheless, not all needs can be fulfilled from women’s online communities. Of these two communities, apparently only most needs are fulfilled. This means that some of the members feel fulfilled, and some feel unfulfilled even though only a few. This can be seen in Table 1.

**Table 1 Level of Needs Fulfillment of Women’s Online Communities**

<table>
<thead>
<tr>
<th></th>
<th>Emak Blogger Community</th>
<th>Ibu Hamil.com Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fulfilled</td>
<td>8%</td>
<td>11%</td>
</tr>
<tr>
<td>Mostly fulfilled</td>
<td>78%</td>
<td>76%</td>
</tr>
<tr>
<td>Least fulfilled</td>
<td>12%</td>
<td>10%</td>
</tr>
<tr>
<td>Unfulfilled</td>
<td>2%</td>
<td>3%</td>
</tr>
</tbody>
</table>

Members with mostly fulfilled needs encourage members of these two communities to have physical meeting or as their term said offline meeting. Members who feel the necessity of offline meeting is quite high as shown in Table 2. This shows that not all needs can be fulfilled from online communities.

**Table 2 The Necessity of Offline Meeting for Members of Women’s Online Communities**

<table>
<thead>
<tr>
<th>Level of Necessity</th>
<th>Emak Blogger Community</th>
<th>Ibu Hamil.com Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly Necessary</td>
<td>72%</td>
<td>66%</td>
</tr>
<tr>
<td>Necessary</td>
<td>25%</td>
<td>27%</td>
</tr>
<tr>
<td>Not Necessary</td>
<td>3%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Table 2 shows that the believe of information and communication technology will reduce physical meeting (Cairncross, 1997) is not proven for these two communities. Members of these communities still need to have physical meeting to follow-up the communication of the women’s online communities. The phenomenon of women’s online communities even shows that information and communication technology will create further demand of physical meeting although the needs of information in online communities has been mostly fulfilled.

### 3. Result

Women’s online community that is established is a group of women with similar interests and needs, which is a need of information. The needs of internet access are high every day. The characteristic of the communities members is quite various from age, profession, as well as residential location.
The social relationship form is flexible and non-hierarchical, which is shown by the members who initially do not know each other and various residential locations.

The space established from the women’s online communities activities is virtual spatial and reality spatial. Virtual spatial is a space where women’s online communities’ members interact and fulfill their needs. However, not all needs can be fulfilled from the interactions. Physical meeting is still required as an impact of the interactions in the online community in reality spatial.

Implication from the social relationship form of women’s online communities to the city planning is that it has become a tendency to utilize information and communication infrastructure not only to communicate conventionally such as using telephone etc. but also has implicated to establishment of communities that are not only based on reality physical spatial but also virtual spatial. The city planning should pay attention on the tendency of the needs of planning, utilizing, and management of information and communication infrastructure as well as the impact of people’s mobility and use of space as a result of new social relationship.

4. Conclusions
From the above data discussion, it can be concluded that:
1. Women’s online communities in Indonesia are an effort to fulfill women’s needs on information concerning their interests facilitated by the information and communication advancement.
2. These women’s online communities have broken the communities’ social relationship physical limitations and hierarchy to be more flexible and geographically spread.
3. It is time for spatial planners to pay attention to the tendency of information and communication infrastructure needs as well as the spatial impact occurred.

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READINESS OF URBAN LAND USE AND TRANSPORTATION PLANNING TECHNIQUE TO ANTICIPATE INCREASING COMPLEXITY OF THE URBAN DYNAMICS

NOVIANDI\textsuperscript{1}, PRADONO\textsuperscript{2}, TASRIF\textsuperscript{3}

Abstract
Reports from the United Nations and the World Bank stated that in 2050, more than 80 percent of the population in developing countries would live in urban areas. Rapid population growth in urban areas caused high transformation growth of urban areas into metropolitan. Unaccompanied rapid population growth by an increase in the capacity of existing infrastructure resulted in various problems, one of which is the problem of congestion in urban transportation systems. Results of JICA study in 2009 stated that the losses due to congestion in Greater Jakarta reached 43 trillion per year. Efforts to overcome the problems of rapid urban growth are often not optimal. One of obstacles faced is most of policy makers have less understanding about the problem as a whole. Efforts to understand the phenomenon of rapid urban development have been done through various modeling techniques. Results of modeling techniques review related to transport and land use systems in urban dynamics in the period 1960 to 2012, showed some limitations of the model or technique used in accommodating dynamic complexity of urban. Early models more focused to the achievement of equilibrium conditions of a systems rather than a portrait of a complex urban dynamics behavior. This is reflected in the lack of attention about some important component of dynamics complexity of urban system, like causal feedback and delay phenomenon in modeling the linkages among components of urban systems. The objective of this paper is to define the area of improvement in planning technique based on limitations of the previous techniques, especially to face the increasing complexity of urban dynamics.

Keywords: Complexity of Urban Dynamics, Transportation and Land Use Integration Models.

1 Introduction

Delays in anticipating the impact of high population growth is one of important factors that caused various phenomena and urban problems in Indonesia. Rapid growth of urbanization process resulted in high growth of land use changes and

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vehicles over the infrastructure and urban environment carrying capacity. The data show that during the period 1995-2005, the urban population continues to grow at a rate of 37% per year, which is followed by an increase in the number of vehicles by 67% per year. While the rural population has continued to decline at rate 8% per year as shown in Figure 1 (Department of Transportation, 2009).

High population growth is a consequence of economic growth in urban areas which is higher than in rural areas. High population growth lead to an increase in land use changes for settlement, trade services, industrial and other activities which in turn triggers the movement of people and goods. Significant impact of high urban growth is reflected on the performance of the urban transportation system that continues to decline, ranging from congestion to rising levels of air pollution from motor vehicles. JICA study in 2009 estimated losses due to congestion in Greater Jakarta reached 43 billion per year. Meanwhile UN stated that Jakarta is the third most polluted city in the world. This condition continues to thrive up until today without a significant breakdown (JICA, 2009).

Failure and delay in understanding that all phenomenon and problems in the transport system is part of the urban system, regarded as one of the factors that caused all efforts and policies to resolve the problem does not meet the expectations. Hypotheses developed in this study are partial sectoral approaches and paradigms still dominating the development of urban transportation system in Indonesia. Although at the policy level it has been developed an integrated approach to the use of space transportation systems contained in the document Sitranas (National Transport System), Tatrawil (Region Level Transportation System) and Tatralok (Local Level Transportation System), but on a technical level, the planning process and implementation of sectoral policies are still very partial.

This condition is possible because it is still difficult to find an approach/ technique analysis which has a systemic approach and accommodate spatial aspects in an integrated way, and also convenience to be applied by the policy makers and planners. Efforts to provide instruments of transportation and land use planning have been developed through modeling. Timmerman study (2003) of Eindhoven University suggested there are at least 3 (three) generations of modeling development that interacted land use model with transport since 1960, the first generation is based on Aggregate Spatial Interaction Approach, the second one is based on Utility-Maximizing Multinomial Logit Approach and the third generation is based on activity-based approach and microsimulation.

Furthermore, in the 2003-2008 era, land use and transport interaction models had been developed mostly are Agent-Based Models and Cell-Based Model (Iocono, 2008). Further investigation related to the development of the interaction model in the era of 2008-2012 shows that along this era could be said as the era utilization and development of models developed in previous generations. Such models are IRPUD Model which modelled the urban energy (Huber, 2013), the development of UrbanSim for modeling transport in some countries such as europe Sustaincity (Axhausen, 2013), Best metropolises in Paris, Berlin and Warsaw (Grochowski,
2013), ILUTM in Brussels (Efthymiou, 2013). Whilst the FALC as a new form of development of the Luti model (Bodenmann, 2012) for applications in Switzerland.

Further review on these models in perspective of systems approach, producing some important findings, among others: a significant difference in the philosophy of the complexity of the system, the paradigm differences of utilized system approaches, as well as differences in the use of the causal feedback loop and delay concept in modeling the linkages of urban system components. Such findings reinforce the hypothesis that the model is not yet fully developed to accommodate the phenomenon of dynamic complexity of urban systems in reality. The complexity of the problem is sensed as the complexity of the mathematical calculations in the models are developed.

2. Benchmark Analysis of Urban Land Use And Transportation Planning Technique

2.1 Methode

The interaction model of land use and transport system have been developed since long time ago. The first publication related to the development of interaction models of land use and transport system is about in the 1960s. Modeling development continues to this day in various forms and methods. Prof. Harry Timmerman (2003) categorize the development of interaction model of the land use and transport system within 3 (three) generations, the first generation model which is dominated by aggregate spatial interaction approach, the second generation model which is dominated by the maximum utility approach and multinomial logit approach, as well as the third-generation model using disaggregate multinomial logit and activity based approach.

Meanwhile Iacono (2008), distinguished the development of interaction models of land use and transport system in a category that similar to the division made by Timmerman (2003), which are: spatial interaction based models, econometric-based models, the disaggregate – microsimulation model, agent based models and cell based models. Illustration of the model development can be seen in Figure 1.

![Figure 1. The Development of Land Use and Transportation Modeling](source: Iacono, 2008)
The purpose of this review is to determine the extent of the phenomenon of dynamic complexity from the interaction of land use and urban transport system has been accommodated in the existing model. Adopting the categorization of modeling the interaction of land use and transportation model made by Timermman (2003), as well as models equipped in the era 2003 to 2012, the authors compiled a simple guide for reviewing models in every generation in accordance with the objective of review.

Each model was reviewed on 4 (four) elements of dynamic complexity phenomena observed in this study, such as: the complexity of the linkages in urban system elements, patterns of linkages between sub-systems, systems approach used as well as the implementation of some important aspects in dynamic complexity. Outline description of each component is as follows:

- **The complexity of linkages in urban system components**

  In modeling the system, one of the success keys used as indicators is the ability of modelers to identify dynamic system that occur from linkages between its constituent elements (Sterman, 2000). It is considered more important than developing a detail level of certain elements. For those reasons, the identification at this stage is intended to look at the extent of linkages between elements of each sub-system used in the model. Scale of 1-6 meant to categorize the level of complexity of the system linkages based on its formed elements. L-1 shows the pattern of a very simple linkages between elements while L-6 shows the pattern of an increasingly complex linkage in the system elements.

  The urban system components identified in this benchmark review are includes five (5) core components such as land use sub-system, sub-system of economy, transport sub-system, population sub-system, and environments sub-systems. The selection of these components are based on several related references such as Chapin (Land Use Planning, 1965), Forrester (Urban Dynamics, 1963), Henderson and Ledebur (Urban Economics, 1972), and Colin Houghhtoun (Sustainable Cities, 1994), Southworth (Technical Review of Land Use-Transportation Model, 1995), Stubbs and Clarke (Megacity Management In The Asia Pacific Region, 1996).

- **The pattern of relationship between components in the system**

  Systems thinking is a way of thinking that focuses on the relationships or linkages between components in a system. In the development of the general theory of systems, various approaches have been established to understanding of the relationship pattern between these elements. However, it can be simply divided into 2 (two) types of elements linkages, which are: a causality realltionship (unidirectional feedback) and feedback causal relationship (causal feedback loop). The first type of relationship is illustrated in Figure 2a-2b. In the

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4A broad model boundary is more important than a great deal of detail. Models must strike a balance between a useful, operational representation of the structures and policy levers available to the clients while capturing the feedbacks generally unaccounted for in their mental models. In general, the dynamics of a system emerge from the interactions of the components in the system-capturing those feedbacks is more important than a lot of detail in representing the components themselves (Sterman, 2000), pp 81.
first type of linkage patterns, there is a free variable (independent) and the
dependent variable (dependent). The behavior of independent variables is
influenced by the dependent variables (Richardson, 1991).

![Figure 2a. Causal Link Unidirectional Concept (Walras Version)](source)

The second type of approach is a feedback causal relationship (causal feedback
loop). The relationship pattern was formed by the close relationship between the
elements / actors / variables in the system, so that every action will produce
feedback on all elements of the system in a non linear rule. A complex system
dynamics arised from the existence of feedback relationship between elements /
variables of the system (Forrester, 1973). In the second type of relationship there
is no independent variables, all variables were related to each other.

![Figure 2b. Causal Link Unidirectional Concept (Marshall Version)](source)

Based on the theoretical basis, this benchmark review will classify the type the
relationship pattern between elements into no feedback, unidirectional
feedback/linear linkages, and causal feedback loops that is non-linear.

- Methods and Paradigm

In the context of social systems and systems theory, known Bureel and Morgan
framework that divides the paradigm of social analysis into 4 (four) perspective
which are: the radical change view, regulative view, subjective view and
objective view. Based on this perspective, it can be further classified as 4 (four)
paradigm of the social theory, which are: the functionalist sociology,
interpretative sociology, radical structuralism and radical humanism\(^5\). Based on this paradigm classification, several system approaches can be classified as shown in Figure 4.

![Figure 4. System Approach in Social Theory](source: Lane, 2001)

Systems approach that belongs to the category of radical humanism paradigm is CSH or Critical Systems Heuristics. While the paradigm of interpretative sociology category includes approaches such as SSM softsystems methodology, SAST Strategic Assumptions Surfacing and Testing and SODA Strategy Options Development and Analysis. Meanwhile for the functionalist sociology paradigm, several approaches that include are VSM Viable Systems Modeling, SE Systems Engineering, SD Systems Dynamics, HS Hard Systems, and Operations Research OR (Lane, 2001). The author have not found the information or literature related to the systems approach in category of Radical Structuralism paradigm. This research study will only cover the benchmark review on modeling paradigm of functionalist sociology. It is based on the fact that modeling the interaction of land use and transportation are mostly located in this area.

Functionalist sociology is a paradigm in the social system theory heavily influenced by objective thinking, reality, positivism and determinisit. This paradigm assumed that social behavior is a phenomenon in which its structure can be observed. System approach in this paradigm focused on understanding the structure of social phenomena through the development of the feedback

\(^5\)Burrell and Morgan (1979) concluded that the social theories then existing could be seen to lie in one of four paradigms. The descriptions of these follow directly from the above account of the axes but their respective accounts of the social world may be (greatly) summarised as follows. The most important is “Functionalist Sociology”; in this paradigm the social world exists outside of humans and so can be observed and the structural laws that sustain it uncovered. Within “Interpretive Sociology” the social world is what agents interpret it to be. “Radical Structuralism” views the social world as a prison of structural economic forces. Finally, in “Radical Humanism” the social world is a psychological prison of economic alienation. Various schools of social theory can be located in one of these four paradigms (Lane, 2001) page 102.
concept. Richardson (1991), in his book entitled “Feedback Thought in Social Science and Systems Theory” stated that in general there are two (2) groups of the feedback concept applied in social science for more than 200 years. The first group is known as The Cybernetics Group (the cybernetics threads), the feedback concept of this group is focused on maintaining the stability of the system, homeostatic mechanism, and input control system that varies randomly (stochastically) and usually ignore the non-linearity. The second group is known as the group servomechanism (the servomechanism threads). This group focuses on the use of the feedback concept to understand the dynamic behavior of a complex social system based on the structure of its internal, non-linearity become an important part of this concept.

- Other Dynamic Complexity aspects

Other aspects of Dynamic complexity phenomenon which is quite important is the concept of delay and policy resistant. Delay is the process by which the fulfillment of output through input takes time (LAGs) / time taken to generate the output ever since the efforts made. Delay is independent from input and output during the transit. Delay can be analogous to the time queue. In some applications, the length of time (delay) is determined based on the results of an investigation of the data and field surveys. In this review benchmark, the observed delay concept is the delay that occurs in the causal relationship between the components of the system being modeled.

Other aspect phenomena of dynamic complexity observed in this benchmark review is the system resistance modeled against the applied policies (policy resistant). The system resistance against the applied policies indicated the response of the system to the policy. At a certain condition, there is a possibility of having a delay in policy implementation, or defeated by other factors so that the impact is not visible. For illustration, the congestion phenomenon of urban transport problem, where a variety of policies have been widely released but the results are not significant in reducing congestion and condition even worse. In this benchmark review the resistance aspects to the policy of a model viewed from the extent to which the "simulation" policy is accommodated in the model.

Based on these simple guidelines, for the next-generation model, the position of the first, second, third generations model and models built in the 2003-2012 era can be mapped within the framework of the systems approach.

2.2 Result

a. Review of First Generation Models

Some of the first generation models include models are often used as a reference such as The Lowry-Garin models (1963-1964), Tomm (Time Oriented Metropolitan Model/1964), PLUM (Project Land Use Model/1971), ITLUP/DRAM/EMPAL/METROPILUS (1975), LILT (1983-1991) and IRPUD (1983). Review according to the guidelines is carried out to the models of the first generation. The recapitulation
of the results of the review can be seen in Table 1. Upon review of the first generation model produced several findings as follows:

- The relationship complexity of urban system components. In this aspect, the first-generation model in general is simple. A fairly high level of complexity shown by the model IRPUD as a final version model of the first generation model. Simplicity linkages can be measured from the completeness of the components involved in the modeling and the complexity of the relationship between these components. In addition IRPUD has complexity at the level of L4-L5, while other models generally have a level of complexity between L1-L3. IRPUD models have accommodated almost all the essential components of the urban system.

- The relationship pattern between components. In general, the relationship pattern the first generation models is a unidirectional one-way relationship. Unless IRPUD models that show a more complex relationship pattern, especially relating to the sub-models of transportation. The use of the feedback concept is one important element of a one-way dynamic complexity. Closed feedback is generally used to achieve equilibrium conditions or to achieve a certain goal, so the concept of using feedback can be categorized as goal seeking feedback.

Table 1. Recapitulation of Result of Benchmark Review from First Generation Models

<table>
<thead>
<tr>
<th>No</th>
<th>System/Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Relationship Complexity of Urban Components</td>
</tr>
<tr>
<td>1.1</td>
<td>Land Use</td>
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<tr>
<td>1.2</td>
<td>Transportation</td>
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<td>1.3</td>
<td>Economy</td>
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<td>1.4</td>
<td>Social</td>
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<tr>
<td>1.5</td>
<td>Environment</td>
</tr>
<tr>
<td>1.6</td>
<td>Urban Facilities</td>
</tr>
</tbody>
</table>

| 2  | Relationship Pattern |
|    | Unidirectional | X | X | X | X | X | X |
| 2.1 | Causal Feedback Loop | - | - | - | - | - | X |

| 3  | Paradigm and Methods |
|    | Cybernetics | X | X | X | X | X | X |
| 3.1 | Servomechanism | - | - | - | - | - | - |

| 4  | Others Aspect |
|    | Policy Resisture | L-1 | L-1 | L-2 | L-3 | L-2 | L-4 |
| 4.1 | Delay | - | - | - | - | - | L-1 |

Note: L1-L6: declared a hierarchical complexity (1 very simple - 6 very complex)

- Paradigms and methods. Systems approach in the first generation model using cybernetic paradigm. This is reflected by using the feedback that is intended to achieve the performance of the system under certain conditions or equilibrium. The concept of a systems approach that leads to a goal seeking and supported by unidirectional linkage patterns and used mathematical equations simultaneously, strengthening the use of cybernetic paradigm in the model of the model. Causal loop diagram method has not been used to translate the linkages between
components of the system qualitatively. Quantifying the linkages is done by using a simultaneous mathematical approach.

- Other aspects of dynamic complexity. In this review, two other important aspects identified from the first-generation model are the delay concept and policy resistant. Results of the review indicated that the new models IRPUD already used the concept of delay in modeling. Other models have not accommodate the concept of delay as an important element that affects the dynamics behavior of the urban system. Meanwhile, about policy resistant, almost all models of the first-generation models have been accommodating policy simulations in various levels of complexity. Lowry Model, TOMM, is the model with the most restrictive policy accommodation, while IRPUD is the first generation model that accommodated comprehensive policy. Trade off between the results of one policy with other policies, although still limited already can be seen at IRPUD models, especially in sub-system transportation

b. Review of Second Generation Models

The second generation models can be said as a development of the first generation models, notably on the calculation method of the allocation of activity in one particular zone, modal choice and route. In the models of this generation, the calculation of the allocation of activity in one particular zone depends not only on accessibility, but also consider the utility function that increase the attractiveness of a location. Some models included in this generation are (Timmerman.2003); The MEPLAN (1969-1994), TRANUS (1984), BASS / CUF (1994), Mussa and urban (1992-1997), CATLAS and METROSIM (1982-1983 ), DELTA (1995-1996), UrbanSim (1996), IMREL (1991-1999), TILT (20000, Uplan (2003)

Review are carried out according to the guidelines of the second generation models. The recapitulation of the results of the review can be seen in Table 2. Upon review of the second generation models produced several findings as follows

- The relationship complexity of the urban system components. Judging from the completeness of the urban system component, the second-generation models have a more complete and detailed urban system components. As the consequence of a more detailed elaboration component, the second-generation model has a higher complexity of the relationship. The combination linkages between household type, land use type and modal type as well as transport routes generated the complex equations. Higher level of complexity shown by the model Tranus and UrbanSim. In general, the second-generation models have a complexity level of the L3-L4, specifically for UrbanSim, it has complexity at the level of L4-L5. The second generation model generally has accommodated almost all vital components of urban system.

- The relationship pattern between components. Although the complexity of the linkages between components is shown by the complexity of the mathematical formulation used in the second generation model, but in general, the relationship pattern in second generation models represent unidirectional one-way
Paradigms and methods. Systems approach in the second-generation models are generally have the same paradigm with the first generation system models that used cybernetic paradigm. This is reflected in the use of feedback that is intended to achieve the performance of the system under certain conditions or equilibrium. The concept of a systems approach that leads to a goal seeking and supported by unidirectional pattern linkages and using mathematical equations simultaneously, strengthening the cybernetic paradigm in the models. Causal Loop Diagram has been applied in several models such as UrbanSim and Transus to accommodate the iterative process. However, the method CLD has not been used in translating qualitative aspects of the relationship between the system components. Meanwhile, quantifying the relationship is done by using a simultaneous mathematical approach based on logit models.

Other aspects of dynamic complexity. Results of the review indicated that some second-generation model has used the concept of delay in modeling (Transus, DELTA and URBANSIM). About policy resistant, almost all models of second-generation models have been accommodating policy simulations in various levels of complexity. Transus models, and Urbansim are models that accommodate most complete and comprehensive policy, meanwhile the CUF model is a second-generation model that accommodates the limited policy simulations. Trade off between the results of one particular policy with other policies (though still limited) can already be seen in the second-generation models, especially in Transus and UrbanSim models.

Table 2. Recapitulation of Result of Benchmark Review from Second Generation Models

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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Relationship Complexity Urban Components</td>
<td>L4</td>
<td>L4</td>
<td>L2</td>
<td>L2</td>
<td>L4</td>
<td>L5</td>
</tr>
<tr>
<td>2.</td>
<td>Relationship Pattern</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3.</td>
<td>Paradigm and Method</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>4.</td>
<td>Other Aspect</td>
<td>L2</td>
<td>L3</td>
<td>L2</td>
<td>L3</td>
<td>L3</td>
<td>L4</td>
</tr>
<tr>
<td>5.</td>
<td>Accessibility</td>
<td>L1</td>
<td>L1</td>
<td>L1</td>
<td>L1</td>
<td>L1</td>
<td>L1</td>
</tr>
</tbody>
</table>

Note: 1. L1-L6: declared a hierarchical complexity (1 very simple - 6 very complex)
c. Review of Third Generation Models

This model is a development of the second generation model by which detailed at the population on group level, individual/actor. Discrete choice method was developed by using multinominal and logit probability as a basis for selection by group/individual/agent. Some late-generation model of this type has been adopted dissequilibrium approach that reflects the dynamics of urban systems. ILUTE Model (1998), RAMBLAS (2000), The Irvine simulation models (2000), ILUMASS (2002), The Oregon Micro Simulation Model (2002), Cellular automata and multi-agent models (1970-2003) is often used as a model reference.

Review are carried out according to the guidelines of the third generation models. The recapitulation of the results of the review can be seen in Table 3. Upon review of the third generation models produced several findings as follows:

- The relationship complexity of the urban system components. The third generation model generally focuses on the micro scale, especially on the actors of land use changes and movement. The third-generation model complexity lies on modeling the individual within the household decision to participate in the movement. Thus this model can be said to be complex in sub-system transportation phenomena particularly in travel demand. Other urban components are placed as factors that influence the decision making process of each actors to move in the modeling. The complexity of the third-generation model lies at L5, especially in sub-system transportation-

- The relationship pattern between components. Generally, the third generation models aimed to describe the dynamic pattern of movement in one particular region performed by an actor for a variety of activities. Thus the phenomenon of decision-making become one of the important components in the relationship pattern between actors with their environment. Patterns of linkages are generally non-linear, although the determination of factors influenced the decision of an actor is calculated linearly. The use of feedback concept of as one of the important elements of dynamic complexity is one way for each activity. Closed feedback is used to provide information to the actors in order to make decisions for moving or not-

- Paradigms and methods. Systems approach in the third-generation models generally used the servomechanism paradigm. This is reflected in using of feedback concept which is intended to provide information in decision making process that does not consider the equilibrium or system balance. The concept of a systems approach directed to describe the dynamics of the behavior and movement activities, and supported by the pattern of linkage causal loop, servomechanism paradigm strengthens the models. Although the causal loop diagram method has not been used specifically to translate the qualitative aspects of the linkages between the components of the system, the mental models have been embodied in the framework of model concept. Meanwhile, quantifying the linkages is done by using a simultaneous mathematical approach.
- Other aspects of dynamic complexity. Results of the review showed that the third generation models have used the concept of delay in modeling (ILUTE, CELLULAR AUTOMATA, RAMBLAS). Meanwhile, about policy resistant, almost all models of third-generation model have been accommodating policy simulations in various levels of complexity.

Table 3. Recapitulation of Result of Benchmark Review from Third Generation Models

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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Relationship Complexity of Urban Components</td>
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<td></td>
</tr>
<tr>
<td>1.1 Land Use</td>
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<td>L-3</td>
<td>L-3</td>
<td>L-4</td>
<td>L-4</td>
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<tr>
<td>1.2 Transportation</td>
<td>L-4</td>
<td>L-4</td>
<td>L-5</td>
<td>L-4</td>
<td>L-2</td>
<td></td>
</tr>
<tr>
<td>1.3. Economy</td>
<td>L-2</td>
<td>L-1</td>
<td>L-1</td>
<td>L-3</td>
<td>-</td>
<td></td>
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<tr>
<td>1.4 Social</td>
<td>L-5</td>
<td>L-4</td>
<td>L-3</td>
<td>L-5</td>
<td>L-3</td>
<td></td>
</tr>
<tr>
<td>1.5 Environment</td>
<td>L-2</td>
<td>-</td>
<td>-</td>
<td>L-2</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1.6 Urban Facilities</td>
<td>L-3</td>
<td>L-3</td>
<td>L-1</td>
<td>L-2</td>
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<tr>
<td>2.</td>
<td>Relationship Pattern</td>
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<tr>
<td>2.1 Unidirectional</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2.3 Causal Feedback Loop</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Paradigm and Methodology</td>
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</tr>
<tr>
<td>3.1 Cybernetics</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>3.2 Servomechanism</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Other Aspect</td>
<td></td>
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</tr>
<tr>
<td>4.1 Policy Resistant</td>
<td>L-3</td>
<td>L-4</td>
<td>L-3</td>
<td>L-4</td>
<td>L-3</td>
<td></td>
</tr>
<tr>
<td>4.2 Delay</td>
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<td>L-1</td>
<td>L-1</td>
<td>L-1</td>
<td>L-2</td>
<td></td>
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</tbody>
</table>

Note: 1. L1-L6: declared a hierarchical complexity (1 very simple - 6 very complex)

d. Models of 2008-2012 Era

Research on modeling the interaction of land use and transportation in the era of 2008-2012 indicates that the models in this era are still using the approach of generation 2 and 3 models as a state of the art. The models developed in this era oriented on implementing such benchmark models as IRPUD, ILUTE and UrbanSim. Development of the benchmark models generally done by strengthening aspects of the presentation (3D, Spatial Visualization) as well as exploring the
modeling component. Integration with the model movement-based activity (activity based) was conducted in order to adopt more dynamic individual behavior.

2.2 Discussions of Review

Development of large-scale models (first generation), in the 1960s brought a great hope of success, especially in bridging the needs of practical application of the urban and regional planning theory. However in 1974, critics on large-scale models are emerging. Preceded by Lee (1973), Professor in planning from the University of Berkeley. He noted criticism known as 7 (seven) sins of the large-scale urban models. The substance of his criticism is very thick with technological barriers of his day (eg Lee, 1973). Another criticism raised by Timmerman (2003), in which he highlighted the lack of models accommodation for understanding the dynamic behavior of spatial. Meanwhile other criticisms led to the model characteristics which tend to be "black box" or not transparent (Waddel, 2010).

In line with the opinion of Prof. Hary Timmerman, Models of G-1, G-2 and G-3 generally focused on housing and workplace location choices based on certain preferences that are attached to the location and accessibility. In fact, nowadays (especially in cities in Indonesia), changing on land use patterns and urban spatial structure is caused by market mechanisms or spatial policies have a significant impact on the urban transport system. Therefore modeling the current era can not ignore the dynamics changing of the spatial patterns of both the macroscopic and microscopic level.

Location theory which underlied the models of G1-G2 and G3 is a theory built in a state where urban dynamics is strongly influenced by the location of the development of the manufacturing industry ('50-'60 era). Today the development of urban area is more complex, the dynamics of urban land use and transportation development can not be regarded as linear. Most cities are dynamically developed into disequilibrium conditions. Therefore the model-based development system which emphasizes on understanding the structure of one particular behavior/urban phenomenon became very significant.

Behavioral changes of urban dynamics that have not become "mainstream" in the era of G1 and G2 models caused the model boundary by which more accommodative to the factors that dominate the era such as land prices, accessibility, industrial area, physical condition of the location and attributes of other locations. Therefore the development of recent model should lead to a life models that adaptive to the changes of urban elements. The model is built based on boundary and modeling purposes. Model G-1 and G-2 are generally set the modeling boundary in macrocospic context so that these models can not describe microscop behavior at an individual level. In their boundary, these models are successfully bridging the traditional location theory with applications (Timmerman, 2003)

Demands on the micro-scale modeling such as dissagregate model appeared along with the increasing on the complexity of urban issues. Therefore the development of microscopic models of individual scales become important, but it does not always
have to replace the macroscopic models, because each model has a different function. Ideally the macro and micro models can be integrated into a complete model. Detailing models vertically are not always able to answer the complexity of occurred urban problems. The dynamics of urban development which is increasingly becoming complex, detailing of the horizontal (relationship among the different sub-systems) and vertical (translation of a particular sub-system) will provide a better opportunities in explaining urban phenomenon that occurs recently. In turn, the model will enrich the theory of the development of the city according to recent era.

The several surveys related to the modeling of land use and transportation interaction showed a trend towards the development of activity-based model approach (Activity-based approaches (Wegener, 2003)). Conditions of rapid technological development has eliminated the barriers of modeling in the past. Integration of GIS technology in the modeling is one of the challenges in the current and future modeling. Aggregate probabilistic modeling (utility maximizing) will be replaced by disaggregate stochastic microsimulation models (Wegener, M, 2003).

3. Conclusions

Based on benchmark review mentioned above, efforts to improve the readiness of planners in anticipating the increase of complexity in urban dinamycs are adjusting and developing of the planning and modeling techniques that can simulate the interaction between land use and transportation systems. Some of the signs or direction of model development that needed to support these efforts include:

1. The method is able to translate the reality of the relationship between land use system components with other components in the transport and urban systems, both qualitatively and quantitatively. The relationship accordance with the urban non linear nature, has a causal linkages, and take into account the delay. Method must have the ability to describe feedback explicity

2. The method should be consistent with the actual behavior of urban systems that are disequilibrium, so the used paradigm approach is part of the servomechanism group. The method is expected to assist in modeling the behavior of urban structures that are "dynamic complexity".

3. The method should be able to support the integration process of macro-meso and micro-scale model. One important aspect is the ability of the model to overcome the difference in time dimension behavior between the system behavior at a macro level, meso and micro

4. The method, suits to the challenges of developing appropriate models, is able to avoid the "black box dilemma". The method developed to support the transparency process of model endogenously

5. The developed method at least can accommodate uncertainty so that the model can be constructed and adaptive to change
6. The method developed can describe the dynamic behavior of land use and transportation interaction spatially. Changes in land use will affect the transportation system an otherwise should be described spatially and dynamically.

One of the model development that aimed to meet the demands of the development methods/planning techniques is on going process through PhD research in Transportation Program-ITB. ULTRANS\textsuperscript{DM} (Urban Land-use dynamics Transportation Model) tried to answer the demands of the modeling by developing the integration between system dynamics methane and spatial dynamics methode. ULTRANS\textsuperscript{DM} expected to assist the policy makers in the city and county level in solving urban transportation problems that have led to substantial losses.

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DEVELOPMENT PATTERN OF LAND USE CHANGE IN CONSERVATION AREA, CASE STUDY: KEBAYORAN BARU, JAKARTA

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Abstract
Kebayoran Baru, built in the 1950s, was planned as a new residential town which based on the neighborhood unit concept. The urban structure of Kebayoran Baru refers to a grid system, in which the road pattern runs from north to south, and from west to east, that divided into four sections. The perimeter area was bordered by circular road, and the neighborhood center was in the middle of the area with the commercials and services. In its development, Kebayoran Baru designated as conservation area and has undergone land use changes. In certain degree, residential function become commercials/trade and services. The functional changes occur mostly at the main roads. The pattern of developmental change is: first, sporadically in some points on the main road; secondly, from south to north changes; third, from east to west; and fourth, on the ring road from north to south. It shows the development of the disparity. The uncontrolled land use changes has resulted in traffic jams, flooding and the lost of Kebayoran Baru identity. Some driving factors of land use change are infrastructure development that is not inclusive, economic pressure driven by increasing accessibility into and out of the area and low community awareness on conservation. The discussion is focused on the development pattern of land use changes that are superimposed with the infrastructure development.

Keyword : land use change, conservation area, infrastructure development, Kebayoran Baru/Jakarta

1. Introduction
Kebayoran Baru is a residential area that is located around Blok M Commercial Center, which is the primary center district of South Jakarta. Because of its strategic location, the area has the potential to change from residential to commercial. In its initial development, the main function of Kebayoran Baru was housing, that occupied an area of 730 hectares of land. As a satellite city at that time, Kebayoran Baru furnished with parks and boulevards. As the development changes residential into commercial function, the green open spaces also reduced and turned into buildings. In line with the land use changes, there are also changes of building forms that affect the overall character of the building and environment.

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As a land use control in Kebayoran Baru, the government has published The Jakarta Master Plan of 1965-1985 and Detailed Spatial Plan of Kebayoran Baru District in 2005. Both plans determined the spatial land use and roads function. Moreover, to control the land-use change the government issued a Governor Decree No. 203/1977 that prohibits the use of dwelling as office or business activity. But those controlling policies do not stop the land use changes which are still continue. The changes especially take place along streets that are assigned as arterial and collector roads.

Urban land use pattern is formed by interaction of human, activities, and location. To conduct their activities, people need space or land and influenced by the socio-cultural background (Farmer, 1979, pp.235). Urban land (Kivell, 1993, pp.3-9) considered as determinant of urban morphology, economic and political force as well as the basis in the urban environment planning system. The influence of economic forces on land use patterns, articulated on the urban physical form. Land use is also a dominant element in urban development control; which include macro and micro scale of land use. Land use determines the interaction/interplay between circulation and activity intensity in an urban area (Shirvani, 1985, pp. 8). Land use policy issues comprise of land use diversification and fallacy in in considering the physical environment factors. Land use planning is a development control strategy to achieve economic growth (Barnett, 1982, pp.158). Land use changes (transformation?) is also an indicator of the growth pattern of the city (Kivell, 1993, pp. 9). Land use changes influenced by: market forces which include forces in demand and supply (Kivell, 1993, pp.14). This paper attempt to discuss the impact of road function assignment policy on land use changes. The method used is the superimpose of infrastructure and land use change policy chronology.

2. Study Area

Study area is located in the district of Kebayoran Baru, South Jakarta. This area was planned in 1953 as a residential. The initial concept of Kebayoran Baru was as the satellite city of Jakarta and a dormitory town. As a dormitory town, master plan of Kebayoran Baru arranged base on neighborhood units. Buildings were grouped according to the type and function in block system named in alphabetical order; which still known today (Blok-A, Blok-B, and so on). In the 1960s Kebayoran Baru started to show a city life by the functioning of the main service center at Blok-M. Shopping centers start to emerge in a temporary building. Character of the building and environment at the initial development have a clear boundary with a greenbelt separates Kebayoran Baru with the surrounding area, namely Kali Grogol at the west part and Kali Krukut at the east, as well as Bung Karno Stadium complex at the north. The public space used the concept of connecting parks. The land use is clear with definite boundaries. Kebayoran Baru was assigned as a conservation area in 1975 by Governor's decree.
3. The Road Function and Land Use Policy

3.1 Year 1953 to 1985

In Kebayoran Baru Master Plan 1953, the main road was set north to south, which includes Jalan Sisingamangaraja, Jalan Panglima Polim, Jalan Patimura, Jalan Hasanuddin and Jalan Iskandarsyah; as well as East to West which includes Jalan Wolter Monginsidi, Jalan Trunojoyo and Jalan Kiyai Maja. The land use plan along the main road was a residential and park or green space at some locations. Blok M area established as commercial and public transport terminals, which serve the public transport from Blok M to Djatinegara. According to the Jakarta Master Plan 1965-1985, the main roads were set on Jalan Sisingamangaraja and Jalan Panglima Polim. Land use plan of Kebayoran Baru was as residential area.

The land use maps published by the Jakarta Urban Planning Agency in 1972, show that there has been a land use transformation from park into office along Jalan Sisingamangaraja and Jalan Patimura. As well as transformation from green spaces into residential along Kali Krukut and Kali Grogol. In 1982 transformations occur not only from parks and green spaces, but also from residential into commercial along Jalan Wolter Monginsidi and Jalan Panglima Polim.

![Figure 1. Map of Kebayoran Baru Master Plan, 1953](image)

Source: Sudiro, 1953, Pembangunan Kota Baru Kebajoran, Jakarta, Ministry of Public Work and Power
Figure 2. The Road Function Plan according to Jakarta Master Plan 1965-1985 and 1982 Land Use.


3.2 Year 1985 to 2011

According to the Detailed Spatial Plan (RRTRW) of Kebayoran Baru District in 2005, the road function plan consists of primary arterial roads, which include Jalan Pattimura, Jalan Hasanuddin and Jalan Iskandarsyah; secondary arterial road, which include Jalan Sisingamangaraja, Jalan Panglima Polim, Jalan Wolter Monginsidi, Jalan Kyai Maja, Jalan Senopati, Jalan Suryo, Jalan Wijaya, and Jalan Wijaya 2. The primary collector roads include Jalan Gunawarman, Jalan Pakubuwono 6, Jalan Gandaria 1, Jalan KH Ahmad Dahlan, Jalan Kramat Pela, Jalan Panglima Polim 9, 13 and Jalan Brawijaya.

In Detailed Spatial Plan (RRTRW) of Kebayoran Baru District in 2005, there’s a change of land use plan from residential into commercial along the east side of Jalan Wolter Monginsidi, Jalan Iskandarsyah, Jalan Panglima Polim, Jalan Melawai, Jalan Bulungan, Jalan Kyai Maja and Jalan Mahakam.
Figure 3. Road Function Map, The Kebayoran Baru Detail Spatial Planning, 2005 and The 2004 Land Use

Figure 4. Road Function Map, The Kebayoran Baru Detail Spatial Planning, 2005 and The 2011 Land Use
According to the land use maps published by the Jakarta Urban Planning Agency in 1996, land use transformation from residential into commercial occur at the east side of Jalan Wolter Monginsidi, Jalan Hasanuddin, Jalan Melawai, Jalan Panglima Polim and the West side of Jalan Kyai Maja. Subsequently in 2001, land use changes are increasing rapidly towards the West as well as the more widespread changes along Jalan Panglima Polim. During that year, land use change also began to occur at Jalan Senopati, Jalan Suryo, Jalan Wijaya, Jalan Panglima Polim 9 and Jalan Kramat Pela. In 2004, land use changes are expanding and widespread along Jalan Senopati, Jalan Suryo, Jalan Kramat Pela. In that year, changes also began to occur at some point in Jalan Gunawarman, Jalan Gandaria 1, Jalan Gandaria 6, Jalan Pakubuwono, Jalan Bumi and Jalan Sisingamangaraja, but in 2011 the land use along those streets were mostly changed into commercial.

4. Discussion

According to 1953 Master Plan and the Jakarta Master Plan 1965-1985, land use plan of Kebayoran Baru were predominantly residential with lots of parks and green spaces. But 1972 existing land use map showed that there have been land use transformations from green spaces or parks into housing and offices. In 1982 land use changes began to spread sporadically along the main road, especially the road that served as main entrance and access from the East, South, West and North. Subsequently, in 1996 the land uses along Jalan Panglima Polim had changed comprehensively. Followed by major changes at Jalan Wolter Monginsidi in 2001, and in 2004, land uses along Jalan Senopati, Jalan Pakubuwono 6, Jalan Kramat Pela and Jalan Panglima Polim 9 almost change entirely.

Some of those changes are eventually legalized in the Detailed Spatial Plan of Kebayoran Baru District (RRTRW) 2005. Specifically are land uses at the East side of Jalan Wolter Monginsidi and both sides of Jalan Panglima Polim that assigned as commercial. This document also assigned function improvement of the roads that have undergone land use changes as primary and secondary arterial road as well as collector road. Therefore, the RRTRW 2005 document was even boost up the intensity of land uses change at those roads mentioned before, as well as the initial transformation from residential into commercial at Jalan Gunawarman.

There's a patterns of land use changes; which began from the major roads or arterial roads, and followed by collector roads. Types of land use changes along those streets are generally from residential into commercial. However, land uses that originally planned as commercial such as Mayestik Market, Santa Market, Blok-C Market and Blok-M commercial area did not affected by the changes that took place around them.

5. Conclusion

There is relationship between the road function policy and land use changes. Changes are mostly took place along streets that function as primary arterial road,
secondary arterial and primary collector. The land-use changes are generally from residential into commercial uses. Therefore, road function assignment correlated with the land use changes into commercial land. The pattern of land use changes along the arterial roads are relatively more rapidly than that took place at the collector road. Road function assignment policy has influence on the speed of land use changes. It means that the higher the road function the land use changes occurs more rapidly. However, planned commercial land uses are not affected by changes around them. Land use change cause damage to the original character of building and environment. If the damage is still ongoing then cultural heritage of the past will be lost. In conservation activities, the initial character should be retained to provide added value to the quality of urban space.

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STREET NETWORK PLANNING AND CHANGING URBAN IDENTITY IN BOGOR CITY CENTER

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Abstract
Streets are the most important infrastructure that serves as organizational elements of the urban development process. Criteria for inclusive infrastructure among others are environmental concerns; consider the local values as well as connectivity. Those are also criteria of urban identity, which is an important quality to achieve sustainability in urban development. However, cities around the world undergo a dynamic process of change, and evolving a new, uniform physical form regardless of their geographical environment and local values. Urban growth, driven by the power of global economic forces, has changes the urban identity. This paper attempts to describe how infrastructure development, particularly street network planning, influences the urban identity in the city of Bogor, which known as a colonial resort city, botanical center, tourism and education. This identity was evident in the streetscape character of the old city center, which built in such way that creates a strong connectivity between parts of the city. Nevertheless, the construction of Jagorawi highway and development of new street networks have led to a shift of city activities, city growth orientation as well as streetscapes character, and eventually bring changes to the urban identity. Morphological analysis of Bogor street networks development and a survey on resident and visitors perception, shows that street classification and functional arrangement as well as development of new arterial street has led to some changes in urban identity and connectivity within the visitors perceptions. Those changes reduce the inclusiveness of street as urban infrastructure.

Keywords: Street network planning, environmental and local values, urban identity, Bogor City

1. Introduction
In the time of rapid urbanization where environmental challenges is critical, infrastructure is the foundation for urban socio-economic systems that affects economic competitiveness, social inclusiveness, quality of life and environmental health. It plays an important role in creating livable urban environment, where all people get equal services (Santucci et.al, 2011). That is the aim of inclusive urban infrastructure. Inclusive urban infrastructure should has environmental concerns and

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consider the potential and local values as well as connectivity. Therefore, street as part of the circulation and transportation infrastructure is very essential. It is undeniably the most important element which serves many roles and functions in the urban system. Street has three physical roles: as circulation route, as public space, and as built frontage (Marshall, 2005). It is also the most significant infrastructure that creates urban form (Kostof, 1992; Wibisono, 2001) and identity (Lynch, 1960; Jacobs, 1993).

Circulation networks can play as generator of activities. Many cities have grown from a circulation networks, and recognized by its street and road networks pattern (Kostof, 1991). Street network is the urban fabric, which serve as framework for the other urban infrastructure in the planning process. It shapes the city and determines the urban landscape, and to some extent it is also a defining element in the liveability and competitiveness of a particular city (Santucci et al., 2011). Accordingly, when the street networks change, they also change the urban form and character of the city or the urban identity. These phenomena occur in many cities in the recent development. Cities around the world undergo a dynamic process of change, driven by the power of global economic forces; they are evolving new, similar physical forms regardless of their geographical conditions and specific local values. Street networks planning became more focus on providing vehicle routes than urban space (Marshall, 2005). Street role as urban space is reduced, in turns it also changes the activity pattern as well as the relationship between building and street space, and eventually it will change the urban identity.

The notion of urban identity is stem from place identity theory (Relph, 2007), which refers to a person identification of place in a city scale (Lalli, 1992; Lewicka, 2011). According to Lynch (1960), urban identity refers to some characteristics that make people recognize or recall a city as an entity distinct from other cities. However, urban identity is not all about physical features. It is the perceive impression of people about urban pattern and the unique character of a city, which unifies environmental, historical, socio-cultural, functional, and spatial values in urban space (Arbak, 2005). Urban identity is the result of people's experience of the city which comprise of complex interaction between physical settings, functions and activities as well as meaning or symbolic aspects of the urban area that created by human activities through history (Relph, 2007; Garnham, 1985; Carmona, 2007). Therefore, developments and changes on physical settings will have impacts, whether negative or positive, on the people's impression about urban space and the identity features (Arbak, 2005). That is why maintaining urban identity is an important issue in term of sustainable development.

Bogor is a city in West Java that built by the Dutch colonial government in the eighteen century with a purpose as a colonial resort and botanical city named Buitenzorg. Bogor identity reflects on its pattern where the city center was oriented around the Palace of Buitenzorg which was surrounded by a vast botanical garden. However, change of the street networks in the recent development have led to a shift of city growth orientation and activities as well as street connectivity. Those changes also affect Bogor urban identity as perceived by residents and visitors. To what
extent street networks planning influences people's perception on urban identity? This paper is a preliminary study of Bogor urban morphology and people's perception of street imageability as an attempt to explain the influence of infrastructure planning on urban identity.

2. Morphological development of Bogor street network and land use

Although its presence can be traced back to the era of Padjadjaran Kingdom in 15th century, but Bogor as a systematic structured city was built by Dutch colonial government at the middle of 18th century when it was re-found after vanished for more than a century (Danasasmita, 1983). The city was formerly named "Buitenzorg", means "no worry", because it was meant to be a resort city for the Dutch who lived in Batavia (Jakarta). The initial building was the Buitenzorg Villa, a monumental building surrounded by a very spacious courtyard, built by Governor-general Baron Van Imhoff in 1745 and later became the official palace for the ruling governor-general (Baihaqie, 2009). After the construction of Groote Postweg or the Great Postal road in 1808 the city structure began to take shape and strengthen by the railway construction at 1880. Since then, Bogor grows in semi-linear pattern, flanked by two major rivers, Ciliwung and Cisadane, with the palace as center and Great Postal road as the main axis of the city that connects Buitenzorg (Bogor) with Batavia (Jakarta) at the north and Cianjur at the south. This main street consists of several segment (see Figure 1.a), from north to south, namely Bataviasche weg (now Jalan Ahmad Yani), Groote weg (Jalan Sudirman and Jalan Juanda), and Handelstraat (Jalan Suryakencana).

In 1817, the palace's backyard was expanded eastward, crossing the Ciliwung river and developed into the largest and the most complete botanical garden in South East Asia. An access road was built around it, and since then the palace with the botanical garden becomes the center of the city development. Various important buildings and public facilities were built around the palace and along the Groote weg as the main street of the city, and settlements have been sprawling mostly at the north-west side of the city. Except an exclusive housing and facilities of botanical education (see Figure 1.b). This structure remains until the early years after the independence of the nation. Visitors, especially who entering the city from Batavia (Jakarta) will find a series of specific streetscape character composed by rows of big canary trees flanking Bataviasche weg; a white obelisk at the junction of Groote postweg; beautiful axial vista towards the palace followed by the curve of palace's fence and beautiful colonial buildings at Juanda street, and ended at the flanking Chinese shophouses along Handelstraat (Jalan Suryakencana). Those streetscapes character gave visual contribution in creating Bogor urban identity.

However, major changes occur after the construction of Jagorawi Highway in 1973, with an exit to Bogor at the east part of the city. Since then, the entrance of the city moved from the Groote postweg (named as Jalan Jakarta or Jalan Raya Bogor after independence) to the highway exit at Baranangsiang. A new road was built connecting the access road at east side of botanical garden (the former Treubweg) with the Groote Postweg from Kedunghalang at the north to Tajur at the south. This
new road named Pajajaran Street, gives a straighter and shorter south-north access across the city. The new street networks development at also changes the growth orientation of the city and stimulate new activities. New housing estates, cafes and restaurants, modern shophouses and shopping malls are springing up along Jalan Pajajaran, which become a new main street of the city beside the old Groote postweg. (see Figure 1.c). In the recent transportation network plan Jalan Pajajaran is designated as the prime-arterial road, while Jalan Sudirman, Jalan Juanda, Jalan A.Yani and Jalan Suryakencana, which are also part of the old Groote postweg, serve only as secondary-arterial road.

![Figure 1. Morphological development of Bogor Street network and land use](image)

3. Functional significance and imageability of Bogor street network

The statutory of Jalan Pajajaran as primary-arterial road shows that it has greater functional significance than the other road, even from the old Groote postweg. The following land use development reinforces the functional significance of Jalan Pajajaran. Massive recent developments take place along this street with more diverse functions and public activities. Some commercial activities that are well accepted eventually become a new destination in Bogor. However, the character of the new developments is more determined by global economic demands. This development has an influence on Bogor urban identity according to people's image. Survey on residence dan visitors (Hartanti & Martokusumo, 2012) shows that Jalan Pajajaran is mentioned as the first most imageable street in Bogor both by residents and visitors, while Jalan Suryakencana becomes the second for residents, but the third for visitors and Jalan Juanda is the third imageable street for residents but the
second for visitors. But for the residents, the coverage of imageable street is wider than visitors (see Figure 2).

Figure 2. Functional significance and imageability of Bogor street network

Those results show that the former Groote Postweg which is now Jalan Sudirman and Jalan Juanda is no longer a representation of Bogor city center. For the residents, it can be attributed to the majority of younger age respondents whose concern are more emphasized to the attraction of activities rather than local symbolic or historical values. Whereas for visitors, those results can be attributed to arrival direction and their purpose of visit. Visitors who are mostly come from the highway, will always pass Jalan Pajajaran to go anywhere in Bogor. Moreover, they are mostly aimed to seek for pleasure and found that destination in Bogor is not only the palace, botanical garden and museums but also bags and fashions factory outlets and specific restaurants.

4. Conclusion

Urban identity composed by three basic components as mentioned by Relph (1976), Garnham (1985) and Carmona (2007), i.e. the physical setting, function or activities, and meaning or symbols which are the result of historical values, human experience and intention on a place. However, the urban identity of Bogor has changed due to the recent urban development, which has been driven by both economic forces and globalization. As the result, (urban) identity of Bogor is some kind of combination between old and new. The distinctive of the physical setting of old areas of Bogor is characterized by big old trees, colonial buildings, and modern shopping malls. The interesting functions and attractive activities in the city is built up by a combination tourism which oriented on botanical and historical potential of the city with modern life style such as shopping malls, factory outlets and specific restaurants or cafes. Likewise, Bogor has a meaningful history as colonial resort city, having a local symbol as a center for tourism and education, but also an emerging shopping destination.
Those changes that compose a unique combination of urban identity are in a certain way influenced by the recent development of street network. The new street networks have stimulated the growth of new activities that created different physical settings as well as new meanings and symbols. Diversity can be positive factors in creating urban identity, as long as those different aspects have a mutual relationship or supporting each other in creating urban life and setting. But in some degree, they can also weaken each other. Bogor can be said to have a critical condition, where the historic or local elements has to be carefully maintained in order not to be vanished. One of which is by a proper, well-planned infrastructure development.

References


HOUSING CARRYING CAPACITY APPROACH AS THE BASIC OF INFRASTRUCTURE PLANNING IN BOGOR CITY

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Abstract
Basically, infrastructure and transportation planning always considering the basic needs and regional economic development. In recent years, the economic growth in big cities has given the spillover effects to their surroundings. In the urban constellation of Jabodetabekjur, Jakarta is the core city, which is supported by its neighbor cities, including Bogor. The most distinctive impact of Jakarta and Bogor economic developing corridor is population growth, especially urban community or commuter. This has been implied in the housing needs as well as its supporting facilities. Nevertheless, the growing population is limited by the land capacity. The availability of land for the sake of housing, roads and other infrastructures has to be basic consideration for planning. Thus, we need to figure the real carrying capacity in order to sustaining the urban land for years. In Bogor City Spatial Plan (RTRW Kota Bogor), it is stated the build area for housing and its facilities in a term called carrying capacity, in this paper examines the carrying capacity for housing needs. The planned area for housing (carrying capacity) is 52% of the total area. This will be used as a threshold for the population projection. Therefore, Bogor City is trying to provide the housing people’s need as well as to achieve its vision as a service and trade city with environmental orientation. This paper examines the carrying capacity as a tool for housing planning in order to achieve the optimal level of service and controlling the city’s development.

Keywords: carrying capacity, housing, population, projection, service

1. Introduction

Rapid population growth in the city of Jakarta was no longer able to be accommodated by the availability of land for housing, so that the land for housing becomes very limited at the very expensive rate. At particular point, this condition will lead the urban to look forward such a proper place to live outside Jakarta. Jakarta as the main core of economic activities attract demand from its surrounding in form of worker as well as land. Eventually, the movement from Jakarta to its surrounding has created a phenomenon called suburbanization. It is simply defined as the outward

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growth of urban development which may engulf surrounding towns into a larger urban agglomeration.

The commuters’ movement from the fringe area to the urban center (esp. center business district/CBD) in big cities was triggered by some factors, such as housing development along the hinterland, and the attractiveness of the CBDs which lead to agglomeration. This is implied to the urban internal structure (Bryant in Rohjan, 2003). In the term of transportation, commuting phenomenon is occured because of the spatial mismatch. Miharja (2005) described spatial mismatch as a spatial structure character related to the locational connection between workplace and livingplace which caused a big trip volume. In the case of Metropolitan Jabodetabek, Jakarta is the development and economic core, and surrounded by satellite cities. One of the most correlated city to Jakarta is Bogor. Bogor has a very distinguished role as a satellite city or buffer area.

Bogor city has been developed as a buffer area for Jakarta which lead the city to the more challenges. The city itself has a limited land for housing, industries, services, and other social – economic activities. But because of its well connected access to Jakarta (by highway and railway), this city keeps attracting more people to come. Rapid population along with the economic growth implies to the high demand of the basic infrastructure and its supporting facilities, including housing. Housing plays a central role in urban planning, since land use for housing has the largest proportion in urban area. Thus, land availability for the residential use is one of the most critical element in urban planning. Moreover, this element could be used as a threshold to determine the portion of city’s build up area and development planning.

In recent years, Bogor City has a tremendous changes in terms of transportation, economy and spatial aspects. As a trading city, where trade and activities related has a strategic development position, Bogor City has to strengthened its infrastructure services to coupe with overflowing demand. Demands from both internal growth and Jakarta’s spillover need to be fullfilled as well as to preserved the environment. The city of Bogor also has an important role in stabilizing the surrounding environment and to preserve its natural resources. On a national scale, the city is also chosen as a pilot project developing the Green City Program (P2KH) of the Ministry of Public Works to create action plans green city. Moreover, in the international forum, Bogor city was declared to be green city (Al Khaer) by the Moeslem Nations.

Those facts implied that the city is faced with so much burdensome factors that pushing it to the limit, while there is an implicit task from the national government as well as international forum to keep its area preserved. Therefore, the physical development of Bogor City has to be maintained as balance as possible along with the environmental preservation efforts by using the carrying capacity element. Bogor spatial plan (RTRW Kota Bogor) has stated that the build area for housing and its facilities is 52% of the total area. This proportion will be used as a threshold for the population projection and to determine whether the area has met their limits. Later,
we will use this population projection to distribute population density and estimate the housing needs and its supply throughout the Bogor City.

The phenomenon of economic and social problem in Bogor City indicates the lack of clear awareness on the carrying capacity. In the face of capital-led mechanism in the city development realm, which focuses in commercial and trading fulfillment, carrying capacity approach is crucial to clearly draw the limit of urban development. This paper discusses the development of land carrying capacity approach as the potential tool to control urban development level in order to maintain acceptable housing and infrastructure level of service.

2. Literature Review

2.1 Suburbanization

Suburbanization can be defined as the outward growth of urban development which may engulf surrounding village and towns into a larger urban agglomeration (coolgeography.co.uk). According to the Ptáček and Szczyrba (2007), suburbanization is understood as a spatial overspill of a city beyond its limit into the open landscape and new activities. The location of new activities is focused in the territory of metropolitan area outside of the compactly built-up area. Suburbanization is a very complex and conditioned process and to the most visible changes on the face of cities. It has two main functional forms: residential and commercial suburbanization and also two main morphological forms: regulated suburbanization (smart growth) and unregulated suburbanization (urban sprawl).

Jakarta is the most suburbanized mega – city in South East Asia (Murakami, et al, 2003). Since the 1990s, the population of Jakarta’s suburbs has surpassed that of its metropolitan core (Hudalah & Firman, 2012). Similar to other Asian mega cities, Jakarta peripheral zones have been pushed by urbanization much beyond their previous extents and have spilled into rural village or towns surrounding the cities. Large scale development has become a major feature of Jakarta’s suburbanization. Past studies conducted on Jakarta’s suburbanization generally restricted their scope of analysis to land development lying within the formal boundaries of the Jakarta Metropolitan Area (Jabodetabek), consists of Jakarta as the metropolitan core, surrounded by its inner suburbs including kotas (municipalities) and kabupatens (districts) adjacent to Jakarta, which are also called Bodetabek. The total area of Jabodetabek is 5,897,52 km².
The growth has been rapid over the past several decades, causing rural – to – urban conversion of large areas surrounding the cities, uncontrolled development, housing shortages, and expansion of squatter settlements (Murakami, et.al, 2003). The process shows that the innermost zone of each city was the most populous, as it continues to be the center of maximum socio-economic activity. This zone became a magnet for people from outside the metropolitan area (Cadwaller, 1001; Morril, 1992 in Murakami, et al (2003). Later, the urbanization process of innermost zone helped to expand the urban areas and increase the diversity of land use on the fringes of the metropolitan areas.

2.2 Population Projection and Carrying Capacity

Expansion of urban areas to the fringes of the city also influenced the distribution of population density. Therefore, we need to project the population trend in terms of growth and distribution. Projection is not a prediction or forecast, but is an indication of future demographic change but on assumptions about future patterns in fertility (births), mortality (Deaths), and migration (BPS, BAPPENAS and UNFPA, 2005). The population projection is very useful to planning. Besides controlling the population density, projection is oriented to provide citizen services and improving economic condition. Eventually, is aimed to meet an ideal condition, when level of service of the infrastructure and transportation is sufficient to the communities.

To get into the balance condition, there is a need to determine an optimal scale which is obtained through infrastructure planning. In analyzing optimization scale, the most fundamental thing to do is determining carrying capacity element. Carrying capacity
is a critical factor in planning, dealing with environmental condition and available resources. On the Regulation of Indonesian Environmental Ministry no. 17 year 2009 carrying capacity is the ability of the environment to support human and other creatures’ life. Moreover, in the context of sustainability, carrying capacity is the size of the population that can be supported indefinitely upon the available resources and services of supporting natural, social, human, and built capital (http://www.sustainablemeasures.com/node/33).

Land use and land capacity determine the the optimal number of family or individu who are capable to stay in a new region, or the maximum number whom can be held to live in the previously developed area. In fact, population growth in a city keeps increasing and tends to surpass its carrying capacity, especially in an emerging city. This is implied to the increasing demand of land for housing and its supporting infrastructures. Hence, to estimate demand for housing is such an imperative task and the very basic tool to determine the carrying capacity.

Carrying capacity of the environment in the context of the availability of land for housing is included: (1) determination of the ability of the allocation of land for housing space utilization and (2) calculation of population projections and land space requirements. Later in this paper, housing demand projection will be derived from some scenarios based on assumption and proportion of housing types, both vertical and horizontal in accordance with the city spatial plan. All these steps are taken as the basic for other infrastructure planning in order to meet the optimum level of service that a city could carry.

2.3 Housing

Based on Law no 1 circa 2011 about Housing and Residential area, housing is a group of home which is part of the settlement in both urban and rural, are equipped within infrastructure, facilities, and public utilities attempted to achieve decent housing. Regarding to its natural as a primary need, housing has a close relationship with the development of a city. According to Sumantri (1986) Several housing
factors may influence development city, in terms of its physical condition, environmental, and locational.

Housing needs could be seen by the potential demand and effective demand. Potential demand means the demanded house based on the number of population who needs it, regardless their affordability. Meanwhile, effective demand is the magnitude of the housing potential demand considering their affordability. followed by a review of the needs of his people, which can be reflected in the amount of income allocated to housing sector (Danial, 1988). Furthermore, scopes of housing needs are the quantity and type of house (related to price, size, location and facilities)

The existing housing needs is heavily influenced by factors, including: Housing Construction to meet the housing demand from households which has yet a home at this time, and the improvement for sub-standard house. Meanwhile, future housing needs is affected by the number of population, migration, household size, housing production and obsolences.

The Regulation of Ministry of Public Housing no. 12 circa 2012 about Implementation of the Housing and Settlement Areas with Balanced Residential Arrangement has regulated residential development based on the principle of benefit, fair, equitable, togetherness, self-confidence, affordability and environmental sustainability. Using a standard ratio of 1: 2: 3, which is considered to be proportional, where the construction of luxury housing units type 1 have followed the construction of medium housing units type 2 and 3 units are simple types. Location of residential areas has to be in line with land use plans which has been settled in the Regional Spatial Plan local or other spatial planning documents established by the local regulation.

3. Methodology

3.1. Population Projection Analysis
There are several methods and formulation order to project the number of population in a certain area. Each method is implied regarding to time and causal factor, such as economic condition, social and culture matter. Due to the characteristic and population trend, it is revealed that Bogor City has an exponential trend, which is tend to increase and slowly remained constant into the asymptote. The asymptote is the indicator for which we desired the population has no longer grow (diminishing) due to limit of carrying capacity. Carrying capacity is a measurement to determine whether a city or region could carry its burden, regarding to is land and water availability. Hence, the population projection is conducted by using the double exponential method. Double exponential method was chosen because its approach to project population aggregately during the desired time period.

The mathematical formulation of double exponential projection is:
\[ P_n = P_\infty a^{b^t} \] \hspace{5cm} (1)
\[ a = \frac{P_\infty}{P_n} \] \hspace{5cm} (2)
\[ \log P_n = \log P_\infty + b^t \log a \] \hspace{5cm} (3)

Where:
- \( P_n \): number of population in projected year (estimated year)
- \( P_\infty \): threshold for a accepted number of population
- \( a, b \): coefficient
- \( t \): time

This method allow us to carry out the threshold or limit of the accepted population in the area, this is what we called carrying capacity. In population projection, threshold is determined by the supply of land availability for housing combined with housing development scenario which stated in Bogor City Spatial.

Along with the double exponential method, this research also using a linear arithmetic method to predict population acceleration in negative way. This method is going to be implied in the overcapacity area, which population has surpass the threshold or its carrying capacity. After we determine the population projection through its carrying capacity, the next step is to analyze the housing needs using the basic needs standard.

**Table 1. Bogor City Housing Scenario Based on Spatial Plan in 2011-2031**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Proportion of Horizontal Housing Type</th>
<th>Proportion of vertical Housing Type</th>
<th>District</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100%</td>
<td>0</td>
<td>All district</td>
</tr>
<tr>
<td></td>
<td>100m² house → 60%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>200m² house → 30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>400m² house → 10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>90%</td>
<td>10%</td>
<td>All district</td>
</tr>
<tr>
<td></td>
<td>100m² house → 60%</td>
<td>Assumed that a vertical house has a density of 400 person/hectare</td>
<td></td>
</tr>
<tr>
<td></td>
<td>200m² house → 30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>400m² house → 10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>80%</td>
<td>20%</td>
<td>All district</td>
</tr>
<tr>
<td></td>
<td>100m² house → 60%</td>
<td>Assumed that a vertical house has a density of 400 person/hectare</td>
<td></td>
</tr>
<tr>
<td></td>
<td>200m² house → 30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>400m² house → 10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>80%</td>
<td>20%</td>
<td>North Bogor, Central Bogor and Tanah Sareal South Bogor, East Bogor</td>
</tr>
<tr>
<td></td>
<td>90%</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100m² house → 60%</td>
<td>Assumed that vertical house has a density of 400 persons/hectare</td>
<td></td>
</tr>
<tr>
<td></td>
<td>200m² house → 30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>400m² house → 10%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Bogor City Spatial Plan in 2011-2031
3.2. Analysis of Supply and Demand of Housing

This analysis is relies on the fact that housing is an important element to be fulfilled as a basic needs for the citizen. Generally, the method that is used to analyze demand in housing and settlement of Bogor City is descriptive comparative by comparing the land demand and supply considering the environmental carrying capacity, and minimum service standard.

4. Area Description

4.1. Physical Aspect and Topography

Geographically, the city of Bogor lies at the 190 m - 330 m above sea level. Bogor city is located in the center of Bogor regency and located very close to the State Capital with a distance about 60km. It is a strategic potential for economic growth and development and services, the national center for industry, commerce, transport, communications, and tourism. Bogor City has an area of 11,850 hectares. Administrative Bogor consists of 6 districts, 31 sub districts and 37 villages, 210 sub villages, 623 RW, 2712 RT and surrounded by a region Bogor Regency is as follows: (1) North Side adjacent with Kemang District, Bojong Gede, and Talbot District, (2) East Side adjacent with Talbot District and Ciawi District (3) West Side adjacent with Darmaga District and Ciomas District (4) South Side adjacent with Cijeruk District and Caringin District

Climatic conditions in the Bogor City average temperature of each month 26 °C with a minimum temperature of 21.8 °C with the highest temperature of 30.4 °C. Humidity 70%, the average rainfall per year is about 3500-4000 mm with the heaviest rainfall in December and January. Bogor city tilt ranged between 0-15% and a small sloped area between 15-30%. The type of soil in nearly all regions are reddish brown with Lotosil effective soil depth of more than 90 cm with soil texture is smooth and is rather sensitive to erosion. For more complete can be seen in Table 4.3.

<table>
<thead>
<tr>
<th>No.</th>
<th>District</th>
<th>0 - 2 %</th>
<th>2 - 15 %</th>
<th>15 - 25 %</th>
<th>15 - 40 %</th>
<th>More than 40 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>South Bogor</td>
<td>169.1</td>
<td>1.418,40</td>
<td>1.053,89</td>
<td>350,37</td>
<td>89,24</td>
</tr>
<tr>
<td>2</td>
<td>East Bogor</td>
<td>182.30</td>
<td>722.62</td>
<td>56,03</td>
<td>44,25</td>
<td>9,80</td>
</tr>
<tr>
<td>3</td>
<td>North Bogor</td>
<td>137.85</td>
<td>1.565,65</td>
<td>-</td>
<td>68,00</td>
<td>0,50</td>
</tr>
<tr>
<td>4</td>
<td>Central Bogor</td>
<td>125.44</td>
<td>560,47</td>
<td>-</td>
<td>117,54</td>
<td>9,55</td>
</tr>
<tr>
<td>5</td>
<td>West Bogor</td>
<td>618.40</td>
<td>2.502,14</td>
<td>-</td>
<td>153,81</td>
<td>10,65</td>
</tr>
<tr>
<td>6</td>
<td>Tanah Sereal</td>
<td>530.85</td>
<td>1.321,91</td>
<td>-</td>
<td>31,24</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>1.763.94</td>
<td>6.993.95</td>
<td>1.109,92</td>
<td>765,21</td>
<td>119,74</td>
</tr>
</tbody>
</table>

*Source: Bogor City in Number 2011
Figure 3 Administration Map of Bogor City

Source: [http://www.kotabogor.go.id](http://www.kotabogor.go.id)
Bogor city divides its area into what so called under sub-district level to order and arrange the spatial planning, namely Urban Zone Sub-Division (Sub Bagian Wilayah Kota). The Urban Zone Sub-Division is a part of zonation unit of city that classified based on the similarity of its function, such as the similarity of land use, the presence of its own central, feasibility of access, the boundaries either physically or administratively. There are 9 Urban Zone Sub-Divisions in Bogor City, include Mekarwangi, Bubulak, Menteng, South Tanah Baru, Pamoyanan, Genteng, North Tanah Baru, Cibogor, and Katulampa.

Table 4. Area of Sub Division Zone in Bogor City

<table>
<thead>
<tr>
<th>No</th>
<th>Sub-Division Zone (BWK)</th>
<th>Area (Ha)</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mekarwangi</td>
<td>1.501</td>
<td>12.56%</td>
</tr>
<tr>
<td>2</td>
<td>Bubulak</td>
<td>1.688</td>
<td>14.12%</td>
</tr>
<tr>
<td>3</td>
<td>Menteng</td>
<td>1.688</td>
<td>14.12%</td>
</tr>
<tr>
<td>4</td>
<td>Tanah Baru Utara</td>
<td>802</td>
<td>6.71%</td>
</tr>
<tr>
<td>5</td>
<td>Cobogor</td>
<td>801</td>
<td>6.70%</td>
</tr>
<tr>
<td>6</td>
<td>Tanah Baru Selatan</td>
<td>1.305</td>
<td>10.92%</td>
</tr>
<tr>
<td>7</td>
<td>Katulampa</td>
<td>1.445</td>
<td>12.09%</td>
</tr>
<tr>
<td>8</td>
<td>Pamoyanan</td>
<td>1.217</td>
<td>10.18%</td>
</tr>
<tr>
<td>9</td>
<td>Genteng</td>
<td>1.508</td>
<td>12.61%</td>
</tr>
<tr>
<td></td>
<td>Bogor City</td>
<td>11.955</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

Source: Bogor City Spatial Plan in 2011-2031

Bogor City has a tremendous changes, especially regarding to the city quality. In an independent report, it is stated that the urban quality of Bogor has been depleted. The diminishing quality of the city was shown by three indicators; transportation, economy and spatial aspects. Like other emerging city in Indonesia, Bogor City also faced some spatial issues dealing with land use changes. This implies as the consequences of policy to determine Bogor as a trading and services city. Therefore, carrying capacity measurement has to be settled to direct the demands to the underdeveloped area and to control or reduce development in the the overcapacity area to keep the city’s level of service.

5. Analysis

5.1. Estimation of Carrying Capacity of Bogor City

In determining the limit of Bogor City population, this study mostly refers to The Spatial Plan of The City of Bogor in 2011-2031. The Spatial Plan allocates 80% of the land into the built area while the others are allocated into the green open space area. The 80% of the area with approximation of 9.48 Ha, are also allocated into the residential, non-residential area and transportation space following the proportion of
65%, 20%, and 15%. These proportions are assumed based on the city plan and the expected future condition. Based on those assumptions, the proportion of land development can be given following in the table below.

Table 3. Estimation of Carrying Capacity of Land Space in Bogor City

<table>
<thead>
<tr>
<th>No</th>
<th>Sub-District</th>
<th>Area (km²)</th>
<th>Green Open Space</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>20%</td>
</tr>
<tr>
<td>1</td>
<td>South Bogor</td>
<td>3081</td>
<td>616</td>
</tr>
<tr>
<td>2</td>
<td>East Bogor</td>
<td>1015</td>
<td>203</td>
</tr>
<tr>
<td>3</td>
<td>North Bogor</td>
<td>1772</td>
<td>354</td>
</tr>
<tr>
<td>4</td>
<td>Central Bogor</td>
<td>813</td>
<td>163</td>
</tr>
<tr>
<td>5</td>
<td>West Bogor</td>
<td>3285</td>
<td>657</td>
</tr>
<tr>
<td>6</td>
<td>Tanah Sareal</td>
<td>1884</td>
<td>377</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>11850</td>
<td>2370</td>
</tr>
</tbody>
</table>

|  | Allocation on Built Area (80%) |
|  | Residential 65% | Non-residential 20% | Transportation 15% |
| 1 | 1602.12        | 492.96        | 369.72 |
| 2 | 527.80         | 162.40        | 121.80 |
| 3 | 921.44         | 283.52        | 212.64 |
| 4 | 422.76         | 130.08        | 97.56  |
| 5 | 1708.20        | 525.60        | 394.20 |
| 6 | 979.68         | 301.44        | 226.08 |
|  | 6162           | 1896          | 1422   |

Based on the estimation of carrying capacity that are showed by table above, the development of residential area should be planned not to be more than 6,164 Ha or equal to 52% of total area of Bogor City, so the other remaining land can be allocated into non-residential function, such as industry, commercial and service, and transportation. Beside of that, it is important to persistently keep the green open spaces remain at 20% of total city area or equal to 2,730 Ha like stated in Law no. 26 circa 2007 about The Spatial Plan. Later, this 52% of land are called the carrying capacity for residential area.

In this study, the residential carrying capacity are acquired by subtracting the planned residential area with the existing built residential area. The difference of these both will be used as the reference to estimate the population that are going to be carried by the remaining land of Bogor City which are developed to be the residential area. As the existing built residential area of Bogor City are 4,155.79 Ha, the remaining area that can be used to develop residential area, or this remaining land later can be viewed as the existing carrying capacity if there are no land use shifting happened until 2031, are 2,008.21 Ha.

After estimating the amount of remaining land available to be developed into residential area, it is important to estimate the demands that will fill these land. To estimate these demands, this study use the population projection methods from 2011 to 2031. The demands in this case are the sum of population that later are assumed as the starting point to estimate the amount of future house by using the assumption of family size of Bogor City while one house is lived by one family only. As explained in previous section, this study uses 4 scenarios to develop the residential area on each sub-district based on the housing type, either horizontal or vertical type.
In developing the residential area based on Bogor City carrying capacity, the scenario 4 is then chosen based on its combination of large proportion of vertical and horizontal housing type. The horizontal housing that are going to be developed are 80% of the remaining area following the proportion of 1:2:3 with 1 for the large-size house (400 m$^2$), 2 for the medium-size house (200 m$^2$), and 3 for the small-size house (100 m$^2$). Meanwhile, the vertical housing are 20% of the same remaining area, so then the calculation of each housing area are now determined in this table below.

<table>
<thead>
<tr>
<th>Housing CC</th>
<th>6164 Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing</td>
<td>5400 Ha</td>
</tr>
<tr>
<td>Remaining</td>
<td>764 Ha</td>
</tr>
<tr>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>Horizontal (Ha)</td>
<td>Large House</td>
</tr>
<tr>
<td>611.2 Ha</td>
<td>Ha</td>
</tr>
<tr>
<td></td>
<td>m$^2$</td>
</tr>
<tr>
<td></td>
<td>unit</td>
</tr>
<tr>
<td></td>
<td>person</td>
</tr>
<tr>
<td>20%</td>
<td>Vertical (Ha) 152.8</td>
</tr>
<tr>
<td>Initial CC</td>
<td>1 Ha = 400 persons</td>
</tr>
<tr>
<td>Existing Population</td>
<td>horizontal + vertical 967,398.00</td>
</tr>
<tr>
<td>Actual CC</td>
<td>1,244,987.67</td>
</tr>
</tbody>
</table>

From the table above, it is known that the size of population can be carried by Bogor City capacity are 1,244,985 persons. Further in this study, the result of the population limitation can be used as we conduct the population projection analysis to acquire the condition about the population amount over the carrying capacity. The modified exponential and double exponential analysis are used in this study to project the population.

5.2 The Case of Population Projection over the Carrying Capacity

Before discussing the population projection of each sub-district to their carrying capacity, it is important to know the population projection of Bogor City to its carrying capacity. By using the double exponential analysis, we can estimate the total population of Bogor City in 2013 to 2033. The assumptions are used to use this methods are: (1) the increasing of Bogor City population happens in one certain time and (2) there is a carrying capacity that limits the increasing of population. By using this assumption and applying the methods, it is known that in 2033 the population is 1,178,311 persons. By comparing these numbers to Bogor City carrying capacity, we can conclude that the population of Bogor City in 2030 are still allowed to be carried by the city.
In this section, some cases of comparing the population projection to carrying capacity will be presented in order to gain the insight of what the planner should be doing about it. First of all, the insight about the general conditions of population projection are needed to know the population description of Bogor City. By using the scenario 4, the carrying capacity of each sub-district can be presented in the following table below.

**Table 5. Carrying Capacity of Sub-Districts in Bogor City**

<table>
<thead>
<tr>
<th>Sub-District</th>
<th>Planned Carrying Capacity</th>
<th>Total of Population in 2011 (in persons)</th>
<th>Actual Carrying Capacity (in persons)</th>
<th>Predicted Population in 2033 (in persons)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>80% of Horizontal and 20% of Vertical Housing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Bogor</td>
<td>-63133</td>
<td>173732</td>
<td>186170</td>
<td>185501</td>
</tr>
<tr>
<td>Central Bogor</td>
<td>-23091</td>
<td>103830</td>
<td>85415</td>
<td>87841</td>
</tr>
<tr>
<td>Tanah Sareal</td>
<td>-39757</td>
<td>195742</td>
<td>197937</td>
<td>197937</td>
</tr>
<tr>
<td></td>
<td>90% of Horizontal and 10% of Vertical Housing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Bogor</td>
<td>235336</td>
<td>184336</td>
<td>323696</td>
<td>225335</td>
</tr>
<tr>
<td>East Bogor</td>
<td>-11002</td>
<td>96617</td>
<td>106638</td>
<td>105315</td>
</tr>
<tr>
<td>West Bogor</td>
<td>203084</td>
<td>214826</td>
<td>345129</td>
<td>267780</td>
</tr>
</tbody>
</table>

From table above, we can classify the subdistricts into three group: (1) sub-districts whose population are carrying capacity, (2) sub-districts whose population are balance with carrying capacity, and (3) sub districts whose population are over carrying capacity. The members of group 1 are North Bogor, South Bogor, East Bogor, and East Bogor Sub-District. The member of group 2 is Tanah Sareal Sub-District, and the member of group 3 is Central Bogor Sub-District. As the sub-districts whose population are under carrying capacity, North Bogor, South Bogor, East Bogor, and West Bogor Sub-District are allowed to develop housing like the plan which is explained in previous table, while the development of housing in
Tanah Sareal Sub-Districts are already full enough and the development of housing in Central Bogor Sub-District are better to be decreased.

Figure 5. Population Projection of South Bogor Sub-District

Figure 6. Population Projection of Tanah Sareal Sub-District
Like the population projection of the sub-districts previously presented, the modified and double exponential regression are also used to project the population in each Urban Zone Sub-Divisions. The result is that they can be also classified into 3 groups: (1) the Urban Zone Sub-Division whose population projection are under the carrying capacity, (2) the Urban Zone Sub-Divisions whose population projection are the same with the carrying capacity, and (3) the Urban Zone Sub-Divisions whose population projection are over the carrying capacity. The Urban Zone Sub-Division of Mekarwangi, Bubulak, Menteng, South Tanah Baru, Pamoyanan, and Genteng are grouped into group 1 while the Urban Zone Sub-Division of Cibogor, North Tanah Baru, and Katulampa are grouped into group 3. By the results of the population projection of the Urban Zone Sub-Divisions relative to their carrying capacity, it was later known how to develop the residential area and its supported facilities.

5.3 Further Housing Development based on Population Projection

By using residential development in applying the function of carrying capacity, further analysis will use the result of previous analysis to develop the residential planning in Bogor City. Basically, the residential development are feasible to be conducted in Bogor City because generally the population in the end of projection year are still under the carrying capacity yet doing this is not as easy as developing it. By reviewing the population projection in the scope of Urban Zone Sub-Division, it is known that 3 of 9 sub-divisions’ population by the end of 2033 are over their carrying capacity. It makes the residential development in this sub-divisions become impossible or even the reduction of existing residential areas are ideally needed. By knowing that the Urban Zone Sub-Division of Cibogor is located in Central Bogor Sub-District which become the center of many kinds activities in Bogor City, it is logically accepted why the explosion of housing development are happened in this sub-division, referring to the common phenomenon in Indonesia cities which all activities are mostly concentrated in the center of the city and followed by the development of facilities and it creates the attraction factor that makes people move
towards the center and later built their home there, either the well managed residential area or the uncontrolled poor managed residential area.

Facing the facts that the population in this sub-division by the year of 2033 are over its carrying capacities and also the presence of some facilities that support the existing residential area are already there, the reduction of residential area in this sub-division will face some obstacles which include the impossibility to reduce, or technically to destroy, the residential areas or the housing structures, the difficulty to restrict community movement to this sub-divisions since they are located in city center, and so on. The feasible actions that can be accounted as the solutions to these obstacles are the restriction of potential development that can stimulate the residential development in this sub-division and the transfer of housing demand that arise from this sub-divisions to the other sub-divisions.

![Figure 2. Population Projection of The Urban Zone Sub-Division of Genteng](image-url)
The residential development area used in this study use the comparison 1:2:3 of house size. The result of housing demand projection shows that in 2033, the demand of housing are approximately 895 units for house type 1, 1,789 units for house type 2, and 2,684 units for house type 3. These numbers are including the excess demands for housing in the Urban Zone Sub-Division of Cibogor, while the housing development in Urban Zone Sub-Division of North Tanah Baru and Katulampa are not conducted. By knowing that there are 3 sub-divisions that have so much...
remaining space for population growth (Genteng, Bubulak, and Pamoyanan), it is a possibility then to do the population growth potential transfer to these sub-divisions. Doing such transfer are basically possible but there are some conditions to be done first, such as the restriction of any development that can generate the population attraction into the city center and transfer this attraction into the 3 sub-divisions. The transfer of the attraction can be applied by dispersing the city activities, especially to these 3 sub-divisions along with the development of its supporting facilities.

6. Conclusion

Population growth is a major consideration that influence the decision making in urban planning, later as the effect of activities developments. Infrastructure planning as the supporting system to the urban planning are needed because it has an ability to develop the infrastructure in terms of what, where, and when, it can support urban activities. As the population continuously grow, the urban planning will someday face the new challenge that is the overpopulation. Overpopulation in this case refers to the conditions when the population of the city are excesses it capacity. Later, in this study, the overpopulation becomes a new concern to develop a new perspective in infrastructure planning. The proposal of carrying capacity in infrastructure planning comes as a result of the further consideration to overpopulation problem.

By comparing the population projection of sub-districts and urban zone sub-divisions of Bogor City, this study conclude that there are some impossible population projection that later become a consideration on further infrastructure development. The population projection in 2033 of Sub-District of Central Bogor shows that it will face the overpopulation, while the others still have spaces to be developed. The same things are also happened at the scope of urban zone sub-divison where 3 of 9 of sub-divisions are facing the overpopulation relative to its carrying capacity in 2033. As this study use the housing development as the tools to determine the carrying capacity, restriction of housing development in the overpopulated area are needed to control its number. Potential solution are founded when there are 3 subdivisions have many remaining space that can accommodate the excess population. Transfer of population by transfer the activities from the city center along with its supporting infrastructures are proposed in this study in order to accommodate the population growth and provide the house for them to live in.

Acknowledgement

First and foremost, the writers wish to thank all the rest of committee who supported this study, especially Bapak Miming Miharja and Ibu Harkunti Pertwi Rahayu for being the part of this study. Also thank you to all the fellow participants of Class Infrastructures Planning Studio of 2013 who have been amazing help throughout undertaking activity of data collection in Bogor city. This study is a part of the main project of Class Infrastructure Planning Studio of 2013 titled “Infrastructure and Transportation Planning of Bogor City in 2013-2033”, which was financed by Bandung Institute of Technology.
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VOLUME 3
INFRASTRUCTURE AND THE ENVIRONMENT
THE DIRECTION OF LAND USE OPTIMIZATION THROUGH ECOLOGICAL FOOTPRINT APPROACH IN THE GRESIK REGENCY-INDONESIA

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Abstract

Environmental carrying capacity imbalance in Gresik regency is caused by increasing activity, population growth and intensively land use change. There is an imbalance between the environment capacity and natural resources consumption. Land use change in Gresik regency brings ecological damage such as decreased land productivity, water crisis, flood and environmental pollution. This study aims to optimize the land use in Gresik Regency based on the land carrying capacity. The method is ecological footprint approach which can show the consumption level of natural resources and the ability of the land to provide consumption needs in land units of global hectare (gha).

The analysis results show that the biocapacity of Gresik Regency reached 319,179,6 gha are widely spread in the rural area. The highest biocapacity percentage is the type of agricultural land by 53.92%. Nevertheless the biocapacity level is not comparable to the ecological consumption which reach about 1.63 million gha, especially in urban areas due to the high population and activity. It strengthens the environmental imbalance in Gresik regency that has ecological deficit by 1.04 gha/capita. The typology of ecological deficit conditions in Gresik regency show that urban areas have very severe deficit conditions while rural areas are still in a state of minor deficit. The optimization of land use needs to be done with the application of urban compact development to control the land use development and energy use. In another zone, rural areas needs the management of agriculture system to increases the cropland productivity as a primary natural resource supply in Gresik regency without reduce the ability of rural economy.

Keywords: Biocapacity, Ecological Footprint, Land Optimization.

1. Introduction

Population increases lead to increased activity needs (demand), followed by utilization of natural resources continues to rise (Arsyad, et al, 2008). This resulted in over-exploitation of land, changes in land use that are not controlled, the decline in the carrying capacity of the environment and the availability of water (Kodoatie,

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Natural resources have a limited carrying capacity limits both of the quantity, quality and continuity to support optimal land use. So that land use is not paying more attention on the environment will be very disturbing continuity of natural resources, land degradation, decline in land productivity and increased social problems such as hunger and poverty (Kodoatie, 2005; Widiatmaka, 2007 and Arsyad, 2008).

In addition, development should aim to increase environmental benefits while maintaining environmental balance in any changes in land use (Soemarwoto, 2004). One implementation of the concept of carrying capacity of the environment for sustainable development is through the soles of the ecological approach (Retnowati, 2011). Ecological footprint concept is a calculation approach of carrying capacity of an area through the comparison of total consumption level of the population and the waste generated by the resident activities and the natural resources availability (Wackernagel and Ress, 1996). Ecological approach is intended to show the soles of the dependence of human life on a place to live as well as securing natural resource capacity for future human existence (Director of Public Works, 2010).

Gresik Master Plan 2010-2030 mentioned that there have been problems including reduced space utilization wide open land significantly. In the period 2002-2008, there has been a broad decline in paddy fields, dry land and farms respectively of 2251.82 ha, 1546.67 ha and 5491.91 ha. Such conditions pose some environmental issues. Prasita’s study (2007) found that since 1999 productivity ponds in Gresik coastal areas has decreased due to the accumulation of sea water pollution by industrial wastes and sewage aquaculture activities. Based on data from the Department of Agriculture, Agriculture and Forestry Gresik wetland productivity in 2007 was 6.1 tons / ha in 2011 but had dropped to 5.5 tons / ha.

Indonesian Space agency based on the study (2005) found that Gresik regency is one of the areas that will experience unbalanced conditions due to population growth and land use change. With an average population growth of 2.3%, the prediction may come true. This issue is also reinforced by the study of the Indonesian Ministry of Public Works (2011) that Gresik regency has warning status. Exploitation of natural resources which almost reached a climax in 2011, consumption of natural resources has exceeded the biocapacity by a margin of 0.9 gha and accompanied an indication of the environmental damage that can hinder supply the consumption needs of the population. (Indonesian Ministry of Public Works, 2011).

Thus the development that occurred in Gresik regency due to population growth and increased economic activity indicates that there has been environmental imbalance. The condition is certainly contrary to the common goal of development is to meet the needs of the population in order to survive and continue to live, as well as improve the quality of life (Irwan, 2005). According to Soeriatmadja (1981), a region can flourish if the true dynamics of the balance of the region in the proportion of land use for various purposes. Therefore, utilization of space in Gresik regency optimum should be done where each component unit activity in the space corresponding to the
maximum interaction region carrying capacity, which in turn provide the greatest benefit to all stakeholders on an ongoing basis (Rusli et al., 2010). It is necessary for the balance of environmental research in Gresik regency through the soles of the ecological approach to support sustainable development.

2. Methode

The purpose of this study was to determine the condition of components of environmental capacity in Gresik regency so that can be the basis of the optimization formulation of sustainable land use. The method used is through the soles of the ecological approach in which the calculation of the consumption of natural resources and the ability of the land to provide for the consumption of the land unit.

In the early stages of analysis will be carried out supply conditions (bio-capacity) each type of land use in Gresik regency and analysis of natural resource consumption demand conditions (ecological food print) through mathematical calculations ecological soles. After that we use analysis of the environmental conditions in Gresik regency through a comparison of the conditions of supply and demand analysis before. Mapping was conducted to determine the condition of each spatial region. The data used are primary data collected by distributing questionnaires to determine household food consumption and energy. While the secondary data obtained from documents related agencies.

2.1. Ecological Footprint Concept

Ecological footprint concept measures total ecological cost (in land area) of the entire supply of goods and services to residents who showed that the population is not only directly requires land for agricultural production, roads, buildings and other, but indirectly also helped realize the land and goods services consumed by the population (Costanza, 2000). While on the requirements, an ecological food print land area needed to meet consumption needs of the population and absorb the waste generated by the activity of the population (Wackernagel and Ress, 1996). Murray (2003) classified land types by human consumption of natural resources, namely food, housing, transportation, and land-consumption goods such as agricultural land, forests, and fisheries.

With this approach, the calculation of the quality of the area converted as standard bio-productive area extents. Bio-productive extents defined as all the land area that contributes to bio-capacity that provides economically supply of biomass concentration (GFN-USA, 2012). This area includes six (6) categories of land, agricultural land, farm land, forest land, fishing grounds, built land and land carbon sink (GFN-USA, 2012). Bio-productive area is called global hectares (gha). Each represents a number of global hectares bio-productive same area. Each group area has its own equivalent factors based on standard productive area, which is an average productivity of 11.2 billion hectares bio-productive on earth (Wackernagel et. al, 2005).
Thus the ecological soles consist of four (4) essential elements, namely population, land area, productivity (yield / ha) of land and resource consumption (ha / capita), which will be part of the calculation results in the calculation of the carrying capacity of an area (Retnowati, 2010). Based methods have been developed by the Global Footprint Network (GFN) (2012) in Guidebook to the National Footprint Accounts 2011 Editions, bio-capacity (BK) for all categories of land is calculated using the following equation:

\[ BK = A \cdot YF \cdot EQF \]

which is:

- \( BK \): Bio-capacity
- \( A \): The total area of each land category
- \( YF \): Yield factor
- \( EQF \): Equivalence factor

While consumption is calculated from the net consumption is influenced by the actual consumption trade (export-import) in the following equation:

\[ EF = (P/Yw) \cdot YF \cdot EQF \]

Because, \( YF = \frac{Yn}{Yw} \), the EF formula can be simplified as follows:

\[ EF = \frac{P}{Yw} \cdot EQF \]

which is:

- \( EF \): Ecological footprint level
- \( P \): The number of harvested products or wastes generated (Consumption in the area)
- \( Yn \): Productivity category calculation of land area
- \( Yw \): Productivity category world land

In calculating the ecological soles (TE) and the calculation bio-capacity (BK), used two (2) conversion factors, namely:

1. Equivalent factor
   Equalizing factor is a factor that converts certain local units into universal units, namely global hectares (gha). Equalizing factor has been determined by the Global Footprint Network to 5 (five) categories of land, agricultural land (2.51), forest land (1:26), farm land (0.46), fishing grounds (0.37) and built land (2.51). This factor is measured from the level of sustainability of land species and population dependent on the land category.

2. Yield Factor
   Based on methods developed GFN (2012) which also refers to Borucke et al (2012), crop factor is the ratio between the productivity of a category of land of an
area with an average productivity of land the same category in the world and in the same year. Such as the following formula

\[ Y_F = \frac{Y_n}{Y_w} \]

Description:
- \( Y_F \): Factors harvest (yield factor) for the land category L
- \( Y_n \): Land productivity (yield) of land category L in the region calculation
- \( Y_w \): land productivity (yield) world for product.

Nevertheless, there are some assumptions yield calculation factor for several different categories of land (Borucke et al, 2012), among others;
1. Land up having the same yield factor with agricultural land due to the assumption that the ordinary urban land converting agricultural land.
2. Land carbon sink has a factor equal to the yield of forest land due to limited data and information on carbon sequestration for other types of land use.
3. Fishing grounds yield factor has a value of 1 or productivity of land with world fisheries area calculation. This is due to the limitations of the data especially on the state of world fisheries or inland areas. FAO organization is only able to collect fisheries data in the 57 countries of the world.

3. Result

3.1. The Biocapacity Condition in Gresik Regency

From the analysis of Gresik has bio-capacity 319,179.6 gha to meet the consumption needs of ecological soles. The largest percentage bio-capacity is derived from the type of agricultural land by 53.92% or 22,252 gha. And bio-capacity smallest percentage of this type of land is forest. This is caused by the lack of land and forest land productivity is also not comparable with the world land productivity. It is inversely proportional to the larger farms are wide and productivity of agricultural land is also better. Thus supply agricultural needs in Gresik regency can be served more than the needs of forestry products.

Bio-capacity landed up high as well as the growth of built land that convert agricultural land. Bio-capacity landed up by 23.88% or 76,231.41 gha. This illustrates the intensity of activity tend to be high and will affect the consumption of natural resources in Gresik regency. The amount of built land is greater than bio-capacity farm land and fisheries respectively 3.39% and 0.17%.

From Figure 1 it can be seen that the Gresik District is a district with the smallest bio-capacity only for 225.37 gha and only consists of bio-capacity farm land. The absence of agricultural land in the District of Gresik makes bio-capacity farmland and building zero. This shows that there is no activity on the supply of agricultural land up.
In aggregate bio-capacity highest in sub Balongpanggang which has a value of 43,334.94 bio-capacity gha. Although influenced by the extent of the area, but the availability of all categories of land with high agricultural productivity make this district the supply is able to support the activities in each type of land use.

Figure 1. Based Regional Typology Bio-capacity rate in Gresik
Source: Analysis Result, 2013

From the figure it can be seen that the southern part of Gresik has bio-capacity relatively larger than other regions. This is not apart of bio-capacity agricultural land in each of the sub-region is also high. While the highest bio-capacity in fishing grounds are in the Central part of Gresik. The region is a district with an area of fisheries and fisheries productivity is higher than other regions. Additionally, the largest bio-capacity in forestry land is on the island of Bawean. When compared as a whole, the district with the highest bio-capacity is the district with large farms because of the ecological footprint concept approach considers agricultural land has the highest level of sustainability as the main food area. In the districts with large fishing grounds such as Sub Manyar and Ujungpangkah tend to have lower bio-capacity.
3.2. Ecological Footprint Condition in Gresik Regency

Ecological footprint calculation is calculated based on the consumption of food, energy, CO2 emissions, and the consumption of wood. From the results of analysis show that the ecological footprint conditions is the highest with 73% of agricultural land. Then forestry land and building land with 20% and 5%. The smallest of ecological footprint level are on land farms that is less than 0.05%. Thus the use of land in Gresik regency should be able to accommodate the needs of priority on agriculture, forestry and construction. Specifically on building land commonly convert other types of land area must be controlled despite high needs for both residential as well as industrial and trade.

On agricultural land, although this type of land dominates land use in Gresik regency but the need for high food makes ecological footprint level in agriculture contributed the highest number on the soles of the overall ecological. Figure 2 shows that urban areas have a high consumption of ecological soles of other regions such as Sub Gresik, Manyar, Kebomas, Menganti, Cerme and Driyorejo. It is not independent of the intensity of the high population in urban areas Gresik.

Figure 2. Typology of Ecological Footprint in Gresik Regency

*Source: Analysis Result, 2013*
3.3. Regional Balance Condition in Gresik Regency

This analysis is done by comparing the value with the ecological footprint per capita and bio-capacity per capita in each region as in Table 1 following (in gha / capita). From this table it can be seen that only the fishing grounds and farms that had balanced conditions while other land types in deficit. Despite this overall total per capita TE and LB per capita experienced a significant deficit.

<table>
<thead>
<tr>
<th>Land Category</th>
<th>EF Per Capita</th>
<th>BC Per Capita</th>
<th>Ecological Deficit</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lahan Pertanian</td>
<td>0.95</td>
<td>0.14</td>
<td>0.81</td>
<td>Moderate Deficit</td>
</tr>
<tr>
<td>Lahan Kehutanan</td>
<td>0.26</td>
<td>0.00</td>
<td>0.26</td>
<td>Minor Deficit</td>
</tr>
<tr>
<td>Lahan Peternakan</td>
<td>0.00</td>
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<td>-0.05</td>
<td>Balance Region</td>
</tr>
<tr>
<td>Lahan Perikanan</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
<td>Balance Region</td>
</tr>
</tbody>
</table>

Table 1. Ecological Deficit Conditions of Each Category of Land

If viewed on any districts as in Figure 3 you will see the different conditions the carrying capacity of each region. On agricultural land, each district having a very significant ecological deficit which bio-capacity that there are not comparable with the ecological footprint level of agriculture. This is particularly noticeable in urban districts Gresik which has the highest deficit ranged between 0.5-0.9 gha / capita, especially in Gresik district that does not have bio-capacity farmland. In the sub-region which is the granary of rice production in the district such as District Balongpanggang Gresik, Cerme, Benjeng, Shamans and Bawean Island are also experiencing ecological deficit amounted to 0.6, 1:19, 0.73 and 0.99 gha / capita. Thus rice consumption has exceeded the rice farmland in the preparations so the need for land management to increase agricultural food production.

On farm land, each district except District Gresik experience surplus conditions where bio-capacity is bigger than the ecological footprint farming. Ecological food print of each district ranged from 0001-0002 gha / capita. Highest surplus is in District Panceng 0.21 gha / capita. Lowest surplus is in District Driyorejo and Manyar have a surplus condition of 0.01 gha / capita. Gresik aggregate surplus experienced by 0:05 gha / capita. Thus is the consumption of agricultural products Gresik regency residents still well above its natural production.

Different conditions occur on forest land. Each district has a very striking deficit condition with deficit of 0.1-0.3 gha / capita. This condition occurs due to the high demand for wood production forests owned while not comparable. Results of analysis of more forest land needs to be absorbed wood consumption needs rather than land carbon sinks. Production forest area is minimal while the highest demand in the aggregate makes Gresik ecological forestry in deficit by 0.26 gha / capita.
On the fishing grounds, each district having different conditions although total Gresik experiencing ecological deficit of 0.01 gha / capita. Duduksampeyan districts, Sidayu, and Bungah experiencing ecological surplus fishing grounds respectively 0.02, 0.003 and 0.001 gha / capita. This is caused by the breadth and productivity of fishing grounds in each district is relatively higher than other districts. While the district with the highest deficit conditions are sub Kedamean with ecological deficit of 0.032 gha / capita.

Different results when viewed from bio-capacity and overall ecological soles. Each of these districts have experienced ecological deficit conditions with a range between 0.7-1.5 gha / capita. While the overall experience Gresik deficit conditions at 1:04 gha / capita. Thus, based on the qualification level of ecological deficit of the China Council for International Cooperation on Environment and Development-World Wide Fund for nature (CCICED-WWF) in 2006 then Gresik has deficit including severe conditions (very less).

Nonetheless there are still sub-districts include moderate deficit that could be considered preserved as rural areas as in Figure 3, among others Shaman District, Panceng, Bungah, Balongpanggang, Menganti, Wringinanom and Sangkapura. Although some urban districts including moderate deficit but wialayh urban land resources are not supporting the natural resource needs of the population. Sidayu districts and Ujungpangkah an urban area not yet have a large ecological deficit. This does not mean the high consumption in the food print of ecological but when viewed in the land use is dominated by aquaculture land where the sustainability in ecological footprint concept is an area with a low level (small bio-capacity conversion).
3.4. Optimization of the land use direction in Gresik

In Figure 3 further strengthens the activity of high intensity urban areas pose a high concentration of the population so that the consumption of natural resources is also increasing. In Figure 3 which shows the groups so that the optimization of land area should be directed at that group. In group 1, which is comprised of a group of urban Gresik District, Manyar, Kebomas, Duduksampeyan, Menganti and Driyorejo need an optimal handling of development either by the application of a compact city so land up growth occurs converge and efficient use of energy and open land can be maintained.

In the second group which is a rural area that consists of two parts. The first part is composed of the southern part of the district Balongpanggang, Cerme, Benjeng, and Kedamean be directed at improving the agricultural land. This is because the high bio-capacity agricultural land in the region such as the analysis of bio-capacity. Increased productivity of agricultural land needed to supply the needs of high food on urban areas. The second part is rural areas comprising the northern part of the Shaman District, Bungah, Sidayu, Ujungpangkah, and Panceng. This region has bio-capacity farmland, fisheries and forestry are high that an increase in productivity of agricultural land and fisheries to make this area as a source of supply.
4. Conclusions

4.1. Conclusion

Of exposure to the above can be summarized as follows:
1. Component based in the land use optimization is ecological footprint level (consumption) and bio-capacity in each land category.
2. Gresik carrying condition overall deficit in a state where the rate of consumption of the population Gresik to existing resources in Gresik regency exceed the capacity of land to produce natural resources.
3. Consumption level of land needed to meet population needs Gresik amounting 1,639,282.63 gha of land existing ecological soles. While bio-capacity available land for its own population of 319,179.06 Gresik gha.

4.2. Recommendation

1. Compact urban development based on urban areas centering Gresik need to be adopted in the arrangement of space.
2. Increase farm productivity and better spatial planning through implementation Agropolitan in rural areas can make rural areas as a source bio-capacity Gresik without decimate development in rural areas

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VERNACULAR INFRASTRUCTURE IN MANAGING URBAN KAMPONG’S GROWTH

Case Study: Kampung Adat (Indigenous) Mahmud, Bandung Regency, West Java, Indonesia

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Abstract
The economic growth of Indonesia in last decade, especially in urban area, influences the urbanization. Consequently, the growth of urban population tends to be uncontrollable, which has been giving multiplier effect, such as: uncontrolled population, economy - social problems. Such condition has been getting worst, because it is not supported by good infrastructure; which is identical to high cost. Vernacular wisdom has specific character; humble, local oriented, climate-adaptive, applicable technology, community based, low cost, which can be adapted in managing urban infrastructure. Such wisdom is based on sustainability; design with consideration for the future, such as; harmony between infrastructure with ecology, which has been practiced by Kampung Adat Mahmud, Bandung regency, West Java, Indonesia. The object of the study is how far Kampong Mahmud as urban Kampong could manage its growth with vernacular approach. The outcome of the study is the recommendation of vernacular infrastructure’s model in managing urban kampong’s growth, which finally can give contribution to urban environment condition.

Keywords: Vernacular infrastructure, manage, urban Kampong’s growth

1. Introduction

1.1. The urban kampong characteristics

Kampung (Kampong) is an unstructured, unorganized and informal settlement in relation to the broader socio-economic system. It can also be realized as a settlement in an urban area without infrastructure, planning or urban economic networking. Poverty, poor of life quality is the common features of kampons. Kampong, a settlement in an urban area, is influenced by trade and commercial goods, generally has high population density, a compact community pattern, better education, more skilled labor, management of society and companies (Greets, 1965; Wiranto, 1997). Urban (Kota) has three meanings: 1) as an urban, city or town; 2) as a city’s centre (down town); 3) as government system. Urban (Kota) is the centre of power, a manifestation of centre in all activities: social, cultural, economic and political. There is separation between Urban (kota) and kampong (kampung). Kampong kota is simply a traditional, spontaneous, diverse settlement in urban area. An urban/city is ‘a place that permits differences encourages the concentration of differences’ (Radovan 1994, p. 166). The great contrast between the kampong and kota is represented in the table 1. The phenomenon of the differences can be
simplified: qualitative value vs quantitative value. Such descriptions of the differences between *kampung* and *kota* mask complexity, ambiguity, even instability in the way which the two realms are to be seen. There is an immense complexity, ambivalence, and ambiguity.

**Table 1: Apparent contrast between *kampung* and *kota***

<table>
<thead>
<tr>
<th>Space and place</th>
<th>Kampong (rural)</th>
<th>Kota (urban)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-rise (on earth) settlement</td>
<td>High-rise (on sky) settlement</td>
<td></td>
</tr>
<tr>
<td>Tiny spaces</td>
<td>Large spaces</td>
<td></td>
</tr>
<tr>
<td>Dense low-rise settlement</td>
<td>Dense high-rise settlement</td>
<td></td>
</tr>
<tr>
<td>Fine grain</td>
<td>Coarse grain</td>
<td></td>
</tr>
<tr>
<td>Diversity</td>
<td>Uniformity/monotony</td>
<td></td>
</tr>
<tr>
<td>Soft space</td>
<td>Hard (enclosed, rigid and walled) space</td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>Private</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Legal</th>
<th>Kampong (rural)</th>
<th>Kota (urban)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Majority illegal (uncertified)</td>
<td>All legal (certified)</td>
<td></td>
</tr>
<tr>
<td>Unprotected</td>
<td>Protected</td>
<td></td>
</tr>
<tr>
<td>Insecure</td>
<td>Secure</td>
<td></td>
</tr>
<tr>
<td>Inclusive: no barriers, and unfenced</td>
<td>Exclusive: gated and fenced</td>
<td></td>
</tr>
<tr>
<td>Unplanned and unregulated</td>
<td>Planned and regulated</td>
<td></td>
</tr>
<tr>
<td>Informal and uncontrolled</td>
<td>Formal and controlled</td>
<td></td>
</tr>
<tr>
<td>Unrecognizable boundaries</td>
<td>Recognizable boundaries</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Structure</th>
<th>Kampong (rural)</th>
<th>Kota (urban)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No bureaucracy</td>
<td>Bureaucracy</td>
<td></td>
</tr>
<tr>
<td>Democratic</td>
<td>Top-down power</td>
<td></td>
</tr>
<tr>
<td>Non-government, <em>RT</em> and <em>RW</em></td>
<td>Government <em>DPRD</em></td>
<td></td>
</tr>
<tr>
<td>Society leaders</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sociocultura</th>
<th>Kampong (rural)</th>
<th>Kota (urban)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community</td>
<td>Individualism</td>
<td></td>
</tr>
<tr>
<td>Self-management of crisis</td>
<td>Top-down management of crisis</td>
<td></td>
</tr>
<tr>
<td>Horizontal conflicts</td>
<td>Vertical conflicts</td>
<td></td>
</tr>
<tr>
<td>Adaptable</td>
<td>Inadaptable</td>
<td></td>
</tr>
<tr>
<td>Tribal</td>
<td>Multi-ethnic or multi-cultural</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Multiplicity</th>
<th>Kampong (rural)</th>
<th>Kota (urban)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple use of buildings</td>
<td>Single use of buildings</td>
<td></td>
</tr>
<tr>
<td>Multiple jobs</td>
<td>Single jobs</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Modernization and globalizatio</th>
<th>Kampong (rural)</th>
<th>Kota (urban)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Kampung</em> and slums</td>
<td>Metropolitan</td>
<td></td>
</tr>
<tr>
<td>Traditional</td>
<td>Modern</td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>Global</td>
<td></td>
</tr>
<tr>
<td>Mutual self-help</td>
<td>Urban manage</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Antony Sihombing, 2004*

**Table 2: Apparent contrast between *kampung* and *kota***

<table>
<thead>
<tr>
<th>Kampungkota</th>
<th>Kampong</th>
<th>Kota</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Space and place</strong></td>
<td>Tiny space</td>
<td>Large space</td>
</tr>
<tr>
<td>Fine grain</td>
<td>Coarse/massive grain</td>
<td></td>
</tr>
<tr>
<td>Low-rise (on earth) settlement</td>
<td>High-rise (on sky) settlement</td>
<td>Private</td>
</tr>
<tr>
<td>Dense (low-rise) settlement</td>
<td>Dense high-rise settlement</td>
<td></td>
</tr>
<tr>
<td>Diversity</td>
<td>Uniformity/monotony</td>
<td></td>
</tr>
<tr>
<td>Soft space</td>
<td>Hard space</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Legal</th>
<th>Kampong</th>
<th>Kota</th>
</tr>
</thead>
<tbody>
<tr>
<td>Majority illegal (uncertified)</td>
<td>Insecure</td>
<td>All legal (certified)</td>
</tr>
<tr>
<td>Inclusive: no barriers, and unfenced</td>
<td>Secure</td>
<td>Protected</td>
</tr>
<tr>
<td>Unprotected</td>
<td>Exclusive: gated</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Antony Sihombing, 2004*
<table>
<thead>
<tr>
<th></th>
<th>Kampungkota</th>
<th>Kampung</th>
<th>Ambiguity of differences of images between <em>kampung</em> and <em>kota</em></th>
<th>Kota</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unprotected</td>
<td>Unprotected</td>
<td>Unprotected</td>
<td>Unprotected</td>
<td>Unprotected</td>
</tr>
<tr>
<td>Unplanned and unregulated</td>
<td>Unplanned and unregulated</td>
<td>Unplanned and unregulated</td>
<td>Unplanned and unregulated</td>
<td>Unplanned and unregulated</td>
</tr>
<tr>
<td>Informal and uncontrolled</td>
<td>Informal and uncontrolled</td>
<td>Informal and uncontrolled</td>
<td>Informal and uncontrolled</td>
<td>Informal and uncontrolled</td>
</tr>
<tr>
<td>Unrecognizable boundaries</td>
<td>Unrecognizable boundaries</td>
<td>Unrecognizable boundaries</td>
<td>Unrecognizable boundaries</td>
<td>Unrecognizable boundaries</td>
</tr>
<tr>
<td>barriers, and unfenced</td>
<td>barriers, and unfenced</td>
<td>barriers, and unfenced</td>
<td>barriers, and unfenced</td>
<td>barriers, and unfenced</td>
</tr>
<tr>
<td>and fenced</td>
<td>and fenced</td>
<td>and fenced</td>
<td>and fenced</td>
<td>and fenced</td>
</tr>
<tr>
<td>Structure</td>
<td>No bureaucracy</td>
<td>No bureaucracy</td>
<td>No bureaucracy</td>
<td>No bureaucracy</td>
</tr>
<tr>
<td>Non-government <em>(RT and RW)</em></td>
<td>Non-government <em>(RT and RW)</em></td>
<td>Non-government <em>(RT and RW)</em></td>
<td>Non-government <em>(RT and RW)</em></td>
<td>Non-government <em>(RT and RW)</em></td>
</tr>
<tr>
<td>Society leaders</td>
<td>Society leaders</td>
<td>Society leaders</td>
<td>Society leaders</td>
<td>Society leaders</td>
</tr>
<tr>
<td>Democratic</td>
<td>Democratic</td>
<td>Democratic</td>
<td>Democratic</td>
<td>Democratic</td>
</tr>
<tr>
<td>Top-down power</td>
<td>Top-down power</td>
<td>Top-down power</td>
<td>Top-down power</td>
<td>Top-down power</td>
</tr>
<tr>
<td>Bureaucracy Government <em>DPRD</em> <em>(Provincial Legislative Assembly)</em></td>
<td>Bureaucracy Government <em>DPRD</em> <em>(Provincial Legislative Assembly)</em></td>
<td>Bureaucracy Government <em>DPRD</em> <em>(Provincial Legislative Assembly)</em></td>
<td>Bureaucracy Government <em>DPRD</em> <em>(Provincial Legislative Assembly)</em></td>
<td>Bureaucracy Government <em>DPRD</em> <em>(Provincial Legislative Assembly)</em></td>
</tr>
<tr>
<td>Socio-cultural</td>
<td>Community Self-management of crisis</td>
<td>Community Self-management of crisis</td>
<td>Community Self-management of crisis</td>
<td>Community Self-management of crisis</td>
</tr>
<tr>
<td>Vertical conflicts</td>
<td>Vertical conflicts</td>
<td>Vertical conflicts</td>
<td>Vertical conflicts</td>
<td>Vertical conflicts</td>
</tr>
<tr>
<td>Individualism</td>
<td>Vertical conflicts</td>
<td>Vertical conflicts</td>
<td>Vertical conflicts</td>
<td>Vertical conflicts</td>
</tr>
<tr>
<td>Top-down management of crisis</td>
<td>Top-down management of crisis</td>
<td>Top-down management of crisis</td>
<td>Top-down management of crisis</td>
<td>Top-down management of crisis</td>
</tr>
<tr>
<td>Inadaptable</td>
<td>Inadaptable</td>
<td>Inadaptable</td>
<td>Inadaptable</td>
<td>Inadaptable</td>
</tr>
<tr>
<td>Multi-ethnic or multicultural</td>
<td>Multi-ethnic or multicultural</td>
<td>Multi-ethnic or multicultural</td>
<td>Multi-ethnic or multicultural</td>
<td>Multi-ethnic or multicultural</td>
</tr>
<tr>
<td>Multiplicity</td>
<td>Multiple jobs</td>
<td>Multiple jobs</td>
<td>Multiple jobs</td>
<td>Multiple jobs</td>
</tr>
<tr>
<td>Multiple use of building</td>
<td>Multiple use of building</td>
<td>Multiple use of building</td>
<td>Multiple use of building</td>
<td>Multiple use of building</td>
</tr>
<tr>
<td>Modernization and globalization</td>
<td><em>Kampung</em> and slums</td>
<td><em>Kampung</em> and slums</td>
<td><em>Kampung</em> and slums</td>
<td><em>Kampung</em> and slums</td>
</tr>
<tr>
<td>Traditional</td>
<td>Traditional</td>
<td>Traditional</td>
<td>Traditional</td>
<td>Traditional</td>
</tr>
<tr>
<td>Modern</td>
<td>Modern</td>
<td>Modern</td>
<td>Modern</td>
<td>Modern</td>
</tr>
<tr>
<td>Metropolitan Global Urban management</td>
<td>Metropolitan Global Urban management</td>
<td>Metropolitan Global Urban management</td>
<td>Metropolitan Global Urban management</td>
<td>Metropolitan Global Urban management</td>
</tr>
</tbody>
</table>

Source: Antony Sihombing, 2004

As seen above, *kampong* and *kota* are in opposition, but there are also important interface between them (Kenworthy, 1997, p. 6). The problems of *kampongs* in big cities, such as in Bandung, are inequality, inequity of the economic system, which arising from inequality, inequity of government policy. These *kampong* problems generate *kota* problems. Urbanization and modernization processes have driven urban-kampong area growing up rapidly, which has caused a nudge among urban modernity and village traditional. The nudging area become transition between village with urban, which give an effect to urban kampong transformation. The problem is how the process of urban-kampong transformation can be managed on the controllable-level, which can be achieved by vernacular approaches. Population growth and agricultural limits leading to global famine, pollution of air and water are environmental issues, which have been raising since last decade. Such issues have been considered as aspects which contribute to the environment degradation. Recent actions has taken place, as vernacularism wisdom; the ecology-oriented and community participation. Such concept, how its implications to the urban’s future development, are significant to be understood.
1.2. Vernacularism wisdom

Vernacular built environment, such as Indonesian vernacular kampong cannot be separated from locality and community participation. The result is built environment which uses native-local materials, traditional structural systems, humble; full of great wisdom, which content universal values; ecological wisdom. Characteristic of local environment, especially ecology which surrounds the building is main aspect. Indigenous society is an example of many vernacular societies in Indonesia, which can survive with their way of life in today’s modernization era. Such condition can be seen in urban kampong in various cities in Indonesia, such as; Kampong Mahmud in Bandung district, West Java.

Vernacular built environmental has developed by human being to fulfill human need, which make built environment has related with human culture. Vernacular built environment is the result of human tradition by trial and error (Rapport, Amos, 1969), they have had tradition with related to their culture and norm, which are affected to built environment; result of ancient tradition, gradually improved in long-term, in response to the needs of their occupants- physical environment[Oliver, Paul, ed., 1997]. Struggle with their physical environment such as resistance to earthquake; combine with their climate, etc, therefore such built environment survive until today [Rapport, Amos, 1969, Oliver, Paul, ed., 1997]. Vernacular built environment have specific characteristics, such as: 1) without supported by theory or building principle, 2) tuned with their local climate and environment, 3) a symbol of their society or their occupants, 4) open-ended with site, accepting changes by their built environment. [Rapport, Amos, 1969]

All forms of vernacular built environment are built to meet specific needs accommodating the values, economies and ways of life of the cultures that produce them [Oliver, Paul, ed., 1997]. The owner is usually an active participant of the built environment process; a permanent maintenance program, fixing any malfunctioning or replacing any deteriorated component [Gutierrez, Jorge. 2004]. Vernacular built environment have sustainable concepts, such as : 1) environment aspect, built environment is built with some consideration to their environment, especially climate, 2) social aspect, this building is accepted by their society, 3)economic aspect, this building is low cost which according to their society economy. Human cultures evolve an adaptive response to their environment, especially climate. The cultures develop technologies as means of fulfilling individual, collective needs and desires, which result in environmental impacts; guaranty dynamic of sustainability, such as: 1)Ecology : the relationship between living organisms and their environment, 2) Culture: the ideas, beliefs, customs, skills, arts, etc., 3) Technology: the science of the practical or industrial arts, applied sciences, method, process, etc. Sustainability involves the mediation between ecology and technology, relies on culturally appropriate attitudes and behavior (Diagram 1).
The tradition in vernacularism is the main role of sustainability; principle on rational settlement culture and tradition are developed pararellly with the development of built environment.

2. Analysis: Vernacular Infrastructure in Managing Urban Kampong Growth; Case Study: Kampung Mahmud, Bandung District, West Java.

The urban kampong, such as Kampong Mahmud is reviewed, which infrastructure function as representation of vernacular’s wisdom; Adat Kampung. Consequently the kampong can control the kampong growth in tolerable-level which harmonize with nature ecology, while it can accommodate its social-culture-economy function. The vernacular infrastructure has been implemented in three main levels, such as: a) Kampong morphology, b) Neighborhood, c) Building.

2.1. Vernacular infrastructure in managing Kampong Morphology

The implementation of vernacular’s infrastructure in level of Kampong can be seen at the role of Citarum river normalization, as main infrastructure which has driven kampong morphology’s transformation. Such normalization has become a significant infrastructure which has managed kampong growth, which can be seen in two phases, such as:

1. Village Settlements before Normalization; in 1997; Kampong Mahmud settlement consist of; settlements, agricultural land and cemetery. Village territory boundary; rice field on the north, the river on the South, and funeral area on the eastern-western area. Residential units are in the middle of the village, paddy fields in the northern part. The cemetery, village founders and old mosques is in the western part. The existence of open space as vernacular infrastructure for social-culture activities is the main character of the kampong, as centre of traditional Islamic religious activities, such as: the old mosque, cemetery, the area for the village elders.
2. Village settlements after river's normalization; There was normalization of Citarum river by local governments in 1997, as representation of ecology preservation (Fig.3-6), such as; meandering and widening of the river; 6-7 times of the original’s width. The result was the separation of Mahmud kampong into two areas; a) built environment; residential centers and funeral area, b) natural environment; farmland. Mahmud kampong become a cohesive area, which is surrounded by clear physical boundary, such as; the Citarum river, and agricultural areas.

3. There is current development as expansion of Citarum river normalization, such as: a) the construction of the bridge, and development of inspection road along the river banks, which connect the kampong with other villages. The circulating form of the linear order is an important element forming village settlements, b) the development of public - transport terminal at the village gate, c) preservation of the raft terminal in the southern part of the village, d) The development of new
mosque, e) Old and new Citarum river become a physical boundary which surrounds the village, which makes Mahmud has a clear physical boundary.

4. Such development has transformed the kampong morphology in secure area from flood, and presevered farmland irrigation. The result; such normalization has given contribution to cohesiveness of kampong settlement; Residential area and public burial places remain united in the village, which secure from flood. The existence farmland guarantees the ecology of the kampong. Mahmud kampong became famous as a place of religious pilgrim, and development of wood craftsmen home industry.

![Figure 7-8: Kampong Mahmud: Before and After Normalization](image)

2.2. The vernacular infrastructure in managing neighborhood

Vernacular infrastructure in managing the growth of neighbourhood include: a) open spaces: social activities, economies activities, religious activities, b) street, c) path.

a) Street and path as neighborhood infrastructure, especially main circulation connects the village to the pilgrim places, influence the development of traditional shops; economic activity of the villager (figure 9-10).

![Figure 9-10. Neighborhood Infrastructure: Street and Paths](image)
b) Open space for social activities: Porch/frontyard of a dwelling house function as open space for social activity, such as: social interaction among community members, children play or parents caring for their children. Relatively close distance without physical boundaries between the buildings, enable the inhabitant’s interaction (fig 11-12). Cluster of residential buildings are formed by open spaces; social-public facilities, circulation activities. Adjacent building’s side enable dwelling units interact each other as neighborhood infrastructure. (Fig.13-14).

![Figure 13-14. Building Terrace](image)

c) Open spaces for economy activities: open spaces between buildings are used for circulation-activities, services- facilities of the house residents, small shop. Economic activity in the form of informal trade has been growing slightly, which change the previous kampong’s settlements. Porch, yard and circulation function as communal social space, and work space for furniture craftsman. The availability an access facilities into kampong, has changed the social identity of the village community. It easier to create social interaction between locals and migrants, such as in spiritual activity on pilgrim activities, which has stimulated other activities in the village settlements. The result; diversification profesional; farmers, a mere cultivators, traders, craftsmen. Various open spaces accommodate such different activities patterns, such as; the patio, yard for workshop, natural open space, terrace. House’s side is used also as small shop or furniture industrial. (Fig.17-19)
d) Open space for religious activities, such as: the front of new mosques and the pitch blank in the back of madrasah, building distance enable residents to interact in religious events. Religious relationships formed by accommodated, mediated by enough open space (Figure 19-24).

There is also the founder village’s tomb which many people do pilgrim. The oldest mosque located before entering the tomb, became the center of the village population, as centre of religious activities, which provide religious and social significance. Mosque as physical space and symbolic meaning; social relations
that occur in the mosque formed as facilitated, accommodated by open space, which stimulate and maintain social interaction between the inhabitants, also visitors which do pilgrim. The mosque and open space created a social space for visitors who do the pilgrim. There is also empty spaciousness between madrasah and the outskirts of the river. Open space in the form of lawn and garden around the madrasah able to accommodate social relationships, territories for the children, religious association. The existence of the mosque’s courtyard make religious activities and other community events can be accommodated.

Figure 25-32. Open Space as Infrastructure for Religious Activities

Madrasah’s and mosques function as public and social-religious facilities. Schools in the western part of the village is an educational facility for the villagers, became a physical space for supporting social-religious activities.

Figure 33-35. Social Spaces Between School Buildings (madrasah)
e) Open spaces for public/services places: The existence of this public facility to be a place for supporting residents activities, also religious visitor’s activities, such as: public sanitation, toilet. (Figure 25-26).

Figure 36-37. Public Sanitation

f) Vernacular materials for open space’s surface: The usage of soil materials surface influence the environment performance, especially in overcoming problem of climate. The specific character of surface is albedo; reflection coefficient; the diffuse reflectivity or reflecting power of a surface (table 1). A lot of open spaces in Mahmud kampong use nature surface, the fabricated material are used at least as possible, therefore the environment’s thermal can be achieved optimal; the environmental friendly kampong (Table 2).

Table 1. Albedo of Various Materials

<table>
<thead>
<tr>
<th>Number</th>
<th>Surface’s material</th>
<th>Albedo (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Deep water</td>
<td>5-20</td>
</tr>
<tr>
<td>2</td>
<td>Gray soil-humidity</td>
<td>6-8</td>
</tr>
<tr>
<td>3</td>
<td>Dry-clear-soil</td>
<td>16-18</td>
</tr>
<tr>
<td>4</td>
<td>building</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>vegetation</td>
<td>10-23</td>
</tr>
</tbody>
</table>

Source: Stull, 2000

Table 2. Albedo of Various Social Spaces

<table>
<thead>
<tr>
<th>Number</th>
<th>place of social space</th>
<th>Before 1997</th>
<th>After 1997</th>
<th>albedo</th>
<th>albedo</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Terrace of residential units</td>
<td>v</td>
<td>v</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>Terrace of residential cluster</td>
<td>v</td>
<td>v</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>Hall/yard for furniture craftsmenwork</td>
<td>v</td>
<td>v</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>Rice field/park</td>
<td>v</td>
<td>v</td>
<td>10-23</td>
<td>10-23</td>
</tr>
<tr>
<td>5</td>
<td>Tomb of the Kampong founder</td>
<td>v</td>
<td>v</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>Places for worship: Mosque, madrasah</td>
<td>v</td>
<td>v</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td>Public MCK</td>
<td>v</td>
<td>v</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>8</td>
<td>Small café in local house</td>
<td>v</td>
<td>v</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>Circulation</td>
<td></td>
<td>v</td>
<td>6-8</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Place for raft</td>
<td>v</td>
<td>v</td>
<td>6-8</td>
<td>6-8</td>
</tr>
<tr>
<td>11</td>
<td>Open spaces</td>
<td>v</td>
<td>v</td>
<td>6-8</td>
<td>6-8</td>
</tr>
<tr>
<td>12</td>
<td>Terminal for public transportation</td>
<td>v</td>
<td>v</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>
2.3. Vernacular Building in Maintaining the Heritage of Kampong

Residential buildings typology has stilt houses, which is made of bamboo walls. The residence is equipped by livestock pens, goat or sheep at the building’s backyard, and utilization under the house; the chicken cage. Space in any residential dwelling consist of: living room, family room, bedroom, kitchen. The size of residential units: 4x6m², 5x7 and 6x8m²m². Building’s side has verandah; a patio or yard for the kids to play. Houses mostly bamboo-walled houses on stilts, the main structure is built up of wood with a height of 30-50 cm from the ground. Homogenity of building material creates a distinctive character of the village. Previous usage of palm fiber roofs / shingle has been changed into roof tiles. Door and window openings are made of wood. Tradition norm was strictly prohibits the use of glass as building material. Low building density indicated by; the scale of the building, a one-story residential dwelling, space for a courtyard/patio. Each homes form group (cluster) of residences. Open space in the form of: circulation, patio, yard and garden become significant elements which order the morphology of the settlement. Therefore the vernacular character of the kampong still preserved. Traditional stall (warung) function as residential’s social space.

![Figure 38-39. Residential Buildings](image1)

![Figure 40. Stall as Residential'S Social Space](image2)

3. Result

In general, vernacular’s infrastructure can manage urban kampong growth, such as; Mahmud kampong, Bandung district, West Java. Vernacularism infrastructure which has been implemented including: the normalization of Citarumriver, the existence of social –economy space, vernacular building. Such implementation was done in three levels:
1. Kampong; transformation of kampong morphology which is driven by the Citarum river normalization; river as main infrastructure become kampong’s physical boundary-infrastructure, which maintain the limitation of kampong growth. A road construction for inspectioning river which evolved into the street outside the kampong, which influence the accessibility into kampong settlement, the development of public - transport terminal at the village gate, preservation of the raft terminal in the southern part of the village, which give an easy way to across the river.

2. Kampong’s open space: becomes neighborhood- infrastructure for social- economy-cultural space, such as: street, path, and open space between buildings.

3. Building: maintaining vernacular building: local material, local technology, vernacular enclosure as response to tropical climate.

![Figure 41. Transformation of Kampung Morphology](image)

4. Conclusion

Vernacularism’s infrastructure has been proved in managing kampong growth, such as Kampung Mahmud, Bandung district, West Java, Indonesia. Such approach as representation of Adat (traditional norm). Such characteristic: river as physical boundary, the preservation of farmland, open space for social-economy-cultural function, the usage of organic material for open space, the preservation of vernacular building. The framework of the vernacularism’s infrastructure can be seen in diagram 2, which shows the relationship; the cause factor, the implementation of vernacular infrastructure, and the result. Vernacular infrastructure also consider ecology aspect, such as climate adaptive implementation; how to overcome the problem of flood, how to accommodate social function, how to use nature surface materials which has lowest degree of radiation reflection (albedo), the usage organic material of houses, in order to improve the kampong, physically and socio-culturally. As a response of environment problem, especially climate. Such implementation has been done as a response to high rainy, flood and high humidity which often happened in the rainy season at the past.
Problems of Kampong

1. Interface with urban character.
2. Natural problem: Flood as main problem, Agriculture
3. Population and building density

Vernacular’s Infrastructure Development

1. Normalization: Citarum River, preservation agriculture area, development public terminal, preservation of the raft terminal
2. Development social-economy-culture space
3. Maintaining Vernacular building

Result

1. The flood has been overcome.
2. Separation of agriculture area and settlement area
3. The intensiveness of religious activities
4. Intesiveness interaction with outside kampong
5. Development home industry-wood craftsmanship

Diagram 2. Framework vernacular infrastructure

References
Sihombing, Antony, 2004, The Transformation Of Kampung Kota: Symbiosys between Kampung And Kota, A Case Study From Jakarta, Department of Architecture, University of Indonesia, Indonesia.
RISK ASSESSMENT OF INUNDATION IN RAWA PENING AREA

Case Study in Rowoboni village, Kebondowo village, Bejalen village, and Banyubiru village

Agustina SETYANINGRUM¹, Annisaa Hamidah I², Alzaena Ulya RUSDIMI³, Dwi Setyo AJI⁴, Bayu ARGΑ⁵

Abstract

Rawa Pening is a natural lake located in Central Java Province, with an area of 2770 Ha. Inundation has been an environmental issue perceived in Rawa Pening for long period of time. The water capacity of Rawa Pening is highly affected by the amount of river discharge that flows into the reservoir, evaporation, agricultural land use and sedimentation. Certain impacts of inundation has been perceived by the communities around the area of Rawa Pening. The main objectives of this research are to assess the potential hazard in Rawa Pening, assess the vulnerability of inundation in Rawa Pening and to assess the risk of inundation in Rawa Pening. The study area was held in village near by Rawa Pening and exposed to the effects of inundation happens in Rawapening namely Banyubiru, Kebondowo, Bejalen and Rowoboni Village. Data collected is primary data that supported by secondary data. The method analysis used in this study are the qualitative and quantitative analysis. The result of the research show that the four villages of study area, have different level of potential hazard. Kebondowo village has low potential hazard. Rowoboni and Banyubiru have high potential hazard and Bejalen has medium potential hazard. The level of vulnerability in four village are medium vulnerability. Risk assessment of the village showed that Village that categorize as high risk are Rowoboni and Banyubiru Village. While village that categorize as medium risk is Bejelen village and just for Kebondowo village categorize as low risk. Disaster risk reduction is one of the efforts to reduce the threat of disasters that may occur in Rawa Pening area. The strategy can be done include structural and non-structural efforts.

Keywords: Potential hazard, Vulnerability, Risk Assessment, Disaster Risk Reduction

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1. Introduction

Rawa Pening is a natural lake located in Central Java Province, with an area of 2770 Ha. In general, this reservoir has two main function which divided into ecological function and social-economy function. From the ecological point of view, Rawa Pening is a cite of the ecological cycle of the water component and its aquatic and biological life. On the other side, Rawa Pening also has functions related to communities around the area as its social-economy function. It provides environmental services for powerhouse, water resources, fishery, irrigation, education, culture, economy and tourism.

Inundation has been an environmental issue perceived in Rawa Pening for long period of time. The inundation may occur due to several causes. High intensity of rainfall that exceeds the reservoir capacity can cause on overflow of rainfall that lead to the surrounding area. Poor drainage system and improper landuse as the elements of vulnerability can aggravate the risk of inundation. It also highly related to the level of community awareness of inundation risk. Not to mention the aspects of demography such as the dinamycs of population in the area of Rawa Pening. The increasing rate of population is accompanied by more constructions for settlements and public facilities. This development certainly affects the land use change of the area. Closed soil surface by the waterproof layer of built area induces the increasing of surface runoff as the result of rainfall. This condition may lead to flooding or inundation when the rain occurs.

Certain impacts of inundation has been perceived by the communities around the area of Rawa Pening. The water level during the inundation has reached point that the water enters houses and interfere activities of communities around the area. The farmers also experience the impacts of inundation as the water level on certain period inundate the paddy field that it cannot be cultivated. The concerning condition of the increasing frequency of inundation in Rawa Pening encourages more study on the risk assessment. As it is a function of hazard, vulnerability, exposure and capacity, the component of risk will be described quantitatively in this study.

The main objectives of the study of inundation in Rawa Pening are to assess the potential hazard in Rawa Pening, to assess the vulnerability of inundation in Rawa Pening and to assess the risk of inundation in Rawa Pening.

2. Methods

Research on risk assesment in Rawapening area is to discern the risk in each of near-by area of Rawapening. Risk based on the relationship between hazards, vulnerability and also element at risk in the area. Banyubiru, Kebondowo, and Rowoboni village located in Banyubiru District are selected as the study area because the three villages are located near by the Rawapening and exposed to the effects of inundation happens in Rawapening. In addition, the villages have variety of land use type and socio-economic diversity so that they are suitable for risk assessment study related to inundation.
Data collected in this study is primary data that supported by secondary data. Secondary data is the data obtained from the government institution or study of literature while primary data is data obtained from fieldwork. Data collected can be seen in Table 1 below:

<table>
<thead>
<tr>
<th>Kinds of data</th>
<th>Data</th>
<th>Indicator</th>
<th>Source of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary Data</td>
<td>Monography data</td>
<td>Population and area</td>
<td>The respective village monography data</td>
</tr>
<tr>
<td>Primary data</td>
<td>Potential of hazard</td>
<td>Frequency and magnitude (Coburn, 1994)</td>
<td>Indepth interview with prominent community personage and field observation.</td>
</tr>
<tr>
<td></td>
<td>Physical vulnerability</td>
<td>Building construction, public service, infrastructure, protective building, (Guide of disaster characteristic and mitigation in Indonesia, 2007)</td>
<td>Indepth interview with prominent community personage and field observation.</td>
</tr>
<tr>
<td></td>
<td>Social vulnerability</td>
<td>Composition of population, educational background, social system, level of security (Guide of disaster characteristic and mitigation in Indonesia, 2007)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Economic vulnerability</td>
<td>Job, average income, financial institution, small-medium industry, skill trainee (Guide of disaster characteristic and mitigation in Indonesia, 2007)</td>
<td></td>
</tr>
</tbody>
</table>

Data analysis is the process of processing the data into information. The method of analysis used in this study are the qualitative and quantitative analysis.

1. Qualitative analysis methods. Qualitative analysis gives full and detailed information about the phenomena or conditions acquired in the field. The information presented is obtained from field observations and interviews with local people. The physical, social, economic and environmental vulnerability described by using the method of qualitative analysis. In addition, the adaptations of society to inundation described by qualitative analysis as well, supported by field documentation.

2. Methods of quantitative analysis. Quantitative analysis method is used to calculate the risks that exist in the Banyubiru, Kebondowo, Bejalen and Rowoboni village using the following formula

The framework research can be seen in figure 1.
3. Result

3.1. Potential Hazard in Rawapening

The four villages of study area, Kebondowo, Rowoboni, Bejalen, and Banyubiru have different levels of potential hazard. Potential hazard level determination based on three concerns which are considered to represent potential hazard level. The three main concerns are height of inundation, frequency, and duration. Determining level of potential hazard in the study area is not solely considering inter villages of study area in terms of classifying low, medium, or high (see Table 2).

<table>
<thead>
<tr>
<th>No</th>
<th>Village</th>
<th>Hazard</th>
<th>Explanation</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kebondowo</td>
<td>Height of Inundation</td>
<td>no</td>
<td>V</td>
<td></td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency</td>
<td>no</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration</td>
<td>no</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Rowoboni</td>
<td>Height of Inundation</td>
<td>yes, ≥60 cm</td>
<td>V</td>
<td></td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency</td>
<td>every rainy season</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration</td>
<td>days – months</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Bejalen</td>
<td>Height of Inundation</td>
<td>yes, ≥60 cm</td>
<td>V</td>
<td></td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency</td>
<td></td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration</td>
<td>days – months</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Banyubiru</td>
<td>Height of Inundation</td>
<td>yes, 1-2 meters</td>
<td>V</td>
<td></td>
<td>High</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency</td>
<td>once a year</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duration</td>
<td>3 months</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: analysis data, 2013
The highest potential hazard to inundation is Banyubiru village, with high potential classification. Knowing the fact that Banyubiru always inundated once a year with high inundation level from 1-2 meters, considered to be high potential. Rowoboni and Bejalen tend to have same hazard potential based on height of Inundation and duration. However, the frequency of inundation in Bejalen village is unknown, which any record of inundation once happened in the village. Based on this concern, Bejalen classified into medium, then Rowoboni is high with the reason of duration. Kebondowo classified as low potential hazard to inundation as it never happen in the village, even the location is nearby Rawapening lake.

Potential hazard class represented in map as figured in Figure 2 below. The map consists of potential hazard class to inundation for the villages of study area.

**Figure 2. Potential Hazard Map**

### 3.2 Vulnerability in Rawapening

Vulnerability is the probability of a disaster object consists of community, structure, service or geographically area that suffered damage or disruption caused by the disaster or the tendency of some object or creature damaged by the disaster (UNDP/UNDRO, 1992). Potential vulnerability in every village in Rawapening area presented in Table 3.
### Table 3. Potential Vulnerability in Rawapening Area

<table>
<thead>
<tr>
<th>No</th>
<th>Village</th>
<th>Social Aspect</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kebondowo</td>
<td>Dominated by male</td>
<td>Kebondowo Social</td>
<td>V</td>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Senior high school graduates</td>
<td>Kebondowo Economic</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tourism organization, ship group organization, culinary group, and crafting group</td>
<td>Kebondowo Physical</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Rowoboni</td>
<td>Dominated by male</td>
<td>Rowoboni Social</td>
<td>V</td>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Senior high school graduates</td>
<td>Rowoboni Economic</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>fishermen and group of save lake organization</td>
<td>Rowoboni Physical</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Bejalen</td>
<td>Dominated by female</td>
<td>Bejalen Social</td>
<td>V</td>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Senior high school graduates</td>
<td>Bejalen Economic</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Karang Taruna and four farmer associations</td>
<td>Bejalen Physical</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Banyubiru</td>
<td>Balance between male and female</td>
<td>Banyubiru Social</td>
<td>V</td>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Senior high school graduates</td>
<td>Banyubiru Economic</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>fishermen and group of save lake organization</td>
<td>Banyubiru Physical</td>
<td>V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: primary data, 2013

Generally, the level of vulnerability in Bejalen village, Karangdowo, Banyubiru dan Rowoboni Village are medium vulnerability (based on primary data). This assessment based on physical, economic, social and environmental indicators. For more detail, here presented the vulnerability map of village around rawapening lake in Figure 3 and Table 4.

### Table 4. Vulnerability Assessment In Rawapening Area

<table>
<thead>
<tr>
<th>No</th>
<th>Village</th>
<th>Aspect</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kebondowo</td>
<td>Social</td>
<td>V</td>
<td></td>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Economic</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Rowoboni</td>
<td>Social</td>
<td>V</td>
<td></td>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Economic</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Bejalen</td>
<td>Social</td>
<td>V</td>
<td></td>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Economic</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Banyubiru</td>
<td>Social</td>
<td>V</td>
<td></td>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Economic</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: analysis data, 2013
3.3 Potential Risk in Rawa Pening

Risk (Risk) is the expected of loss due to a disaster or loss of trace elements at risk in the future in a certain time period (UNDP/UNDRO, 1992). Risk in 4 village around Rawa Pening lake categorize as high, medium and low risk. Village that categorize as high risk are Rowoboni and Banyubiru Village. While village that categorize as medium risk is Bejelen village and just for Kebondowo village categorize as low risk. For more detail, here presented the risk map of village around Rawa Pening lake in Figure 1.4 and Table 1.5

Table 5. Risk Assessment in Rawa Pening Area

<table>
<thead>
<tr>
<th>No</th>
<th>Village</th>
<th>Hazard</th>
<th>Vulnerability</th>
<th>Capacity</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kebondowo</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>2</td>
<td>Rowoboni</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>3</td>
<td>Bejelen</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>4</td>
<td>Banyubiru</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
</tr>
</tbody>
</table>

Source: analysis data, 2013
4. Conclusion

Inundation has been an disaster issue in Rawa Pening for long period of time. The inundation happened because high intensity of rainfall, poor drainage system, improper landuse and the level of community awareness of inundation risk. The village with the highest hazard potential is in the Rowoboni and Banyubiru. While all of the village have a medium level of vulnerability. From that function (hazard and vulnerability) is known that Rowobono and Banyubiru have a highest level of Inundation risk.

References
PLANNING FOR EVACUATION ROUTES AND EVACUATION BUILDINGS BASED ON TSUNAMI RISK ANALYSIS IN THE BENGKULU CITY

Study Case on Marlborough Fort and Great Mosque

IchsanWibawa¹, Ir. Djoko Santoso Abi Suroso, Ph. D²

Abstract

Even though the potential hazard of tsunami disaster is high, the Bengkulu city is still lacking of tsunami mitigation. Driven by that condition, this research tries to determine a better evacuation routes and evacuation buildings plan as the effort to reduce the risk based on Wisner’s Pseudo-Equation of Risk Analysis (Risk = Hazard x Vulnerability). The step by step method consists of determining the Hazard factor using four scenarios of tsunami height from J.C. Borrero that translated into a DEM (Data Elevation Model) layer to produce a tsunami inundation map and determining vulnerability factors of structural engineering (total height of buildings and buildings distance from the shoreline) and social (population density). The result of risk level shows most areas in the edge of shoreline have a “very high danger” level of tsunami disaster, thus to reduce the risk this research examines the adequacy of 31 evacuation buildings and their routes which are previously proposed by the Ministry of Public Works using a GIS analysis of: maximum evacuation distance, maximum capacity and public opinion. In addition to that, this thesis also proposes as much as 18 new alternative evacuation buildings and their routes as the complement of those existing 31 buildings to give more evacuation coverage in the city.

Keywords: Tsunami, Risk, Hazard, Vulnerability, GIS, Marlborough Fort, Great Mosque.

1. Introduction

The Bengkulu city is located in 3°45’ - 3°59 South Latitudes and 102°14’ - 102°22’ East Longitudes in the western part of Sumatera island near the subduction zone of Indian-Australian plate pushing north-northeast to the Eurasian plate called SundaMegathrust at the rate of 50mm per year (Sieh, 2012).

In the past, there have been several Tsunamis in this region. Two of which were the Indian Ocean Tsunami in 2004 that killed 220.000 people all over the world (NOAA, 2013) and the Mentawai Islands Tsunami in 2010 that resulted in 400 people killed or missing (Pariatmono, 2012).

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Figure 1. The proximity of western Sumatra region with the Sunda Megathrust, the Bengkulu city is represented by a red box in the Figure.  
Source: Sieh, 2012

However, the city does not have a proper mitigation even though the potential threat of tsunami is high. Therefore, this thesis tries to analyze the tsunami risk in the city using Risk Analysis and conduct a GIS Analysis for Evacuation Buildings and Routes as an effort to reduce the risk.

2. Methodology

The phase of methodology of this research is divided into three main phases: The first is to find out the tsunami risk in the Bengkulu city using Wisner’s Pseudo-Equation (Wisner, 2004) that divided into three sub-phases, which are: Hazard Analysis, Vulnerability Analysis, and Risk Level Analysis.

The second is to conduct a set of GIS Analysis for as much as 31 evacuation buildings and their routes (which is proposed by the Ministry of Public Works) as an effort to reduce the tsunami risk. The GIS analysis is divided into three sub-phases, which are: Maximum Evacuation Distance, Maximum Capacity and Adequacy analysis through public opinion.
The last phase is to examine as much as 18 new evacuation buildings as the alternative evacuation buildings. The purpose of this phase is to complement the previous study result of the Ministry of Public Works.

2.1. Hazard analysis

The element of Hazard requires data input of tsunami height simulation based of several scenarios of earthquake, which is taken from the work of J.C. Borrero (Borrero, 2006).

Figure 2. Tsunami height based on 4 different earthquake scenarios.
(1) 1797 earthquake, 8.4 to 8.6 Mw generating 1 m tsunami, (2) 1833 earthquake of 8.6 to 8.9 Mw generating 3 m tsunami, (3) scenario 1 (moderate case) of 8.9 to 9.2 Mw earthquake generating 6 m tsunami, and (4) scenario 3 (worst case) 9.3 Mw generate up to 9 m tsunami


The making of Hazard map is divided into two steps: The first is to create a contour map from the DEM (Data Elevation Model) file that still in the form of dots containing XYZ information (coordinates and elevation).
Figure 3. DEM (Data Elevation Model) in its original format, which is XYZ Points file.

Figure 4. Converting the DEM (Data Elevation Model) into contour using 3D Analyst Tools in ArcGIS 9.
The second step is to give the graduate colors for the contour layer in Symbology tab on ArcGIS Layer Properties box using the result of Borrero’s tsunami simulation scenario values. The result is five classes of tsunami inundation zone based by elevation that classified from “very low danger” to “very high danger”.

Figure 5. Tsunami inundation map level as the Hazard map.

2.2. Vulnerability Analysis

The Vulnerability factor consists of Structural Engineering Vulnerability (Total height of building and distance from beach) and Social Vulnerability (Population Density). The Structural Engineering Vulnerability uses a reference from another source to determine the danger level of Total Height and Distance from Beach.

The reference mentioned is the result of study of HamzahLatief in an article titled “Pemodelan&PemetaanRendamanTsunamisertaKajianResikoBencanaTsunamiKota"
Bengkulu” (Latief et al, 2006), which is a part of articles collection in LIPI research report book titled “Informasi Peringatan Dini Kepada Masyarakat Rawan Bencana”.

Table 1. Classification of total elevation and building heights (Latief, 2006).

<table>
<thead>
<tr>
<th>No</th>
<th>Classification</th>
<th>Total Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very Dangerous</td>
<td>Less than 2.5 meters</td>
</tr>
<tr>
<td>2</td>
<td>Dangerous</td>
<td>2.5 – 5 meters</td>
</tr>
<tr>
<td>3</td>
<td>Quite Dangerous</td>
<td>5 – 9 meters</td>
</tr>
<tr>
<td>4</td>
<td>Less Dangerous</td>
<td>9 – 25 meters</td>
</tr>
<tr>
<td>5</td>
<td>Not Dangerous</td>
<td>Over 25 meters</td>
</tr>
</tbody>
</table>

This research uses an assumption based on several Regional Government Regulations (1) in order to determine the height of buildings in the city due to the lack of reliable data for building height.

Table 2. Assumption used for building height.

<table>
<thead>
<tr>
<th>Type</th>
<th>Example</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>Housing</td>
<td>6 m</td>
</tr>
<tr>
<td>Economical</td>
<td>Shop, market, office, hotel, tourism, bus terminal</td>
<td>12 m</td>
</tr>
<tr>
<td>Social Education</td>
<td>School, culture, medical, public service</td>
<td>17 m</td>
</tr>
<tr>
<td>Religious</td>
<td>Mosque, church, monastery, pagoda</td>
<td>15 m</td>
</tr>
<tr>
<td>Other type</td>
<td>Power plant, defense</td>
<td>12 m</td>
</tr>
</tbody>
</table>

The Total Height is a total value of the height of each building and the elevation height of the area where the building is located (which is obtained from the contour layer).

Next is giving the danger level of building’s height, using the classification from Hamzah Latief as shown in Table 1 above. The result of Vulnerability of Total Building Height can be seen in the Figure 6. For the Vulnerability of Building’s Distance from the Shoreline, the classification comes as follow:

Table 3. Classification of distance from beach (Latief, 2006).

<table>
<thead>
<tr>
<th>No</th>
<th>Classification</th>
<th>Distance from beach</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very Close</td>
<td>Less than 0.5 km</td>
</tr>
<tr>
<td>2</td>
<td>Close</td>
<td>0.5 – 1.5 km</td>
</tr>
<tr>
<td>3</td>
<td>Quite Close</td>
<td>1.5 – 2.5 km</td>
</tr>
<tr>
<td>4</td>
<td>Far</td>
<td>Over 2.5 km</td>
</tr>
</tbody>
</table>

1) Barito Kuala Regional Government Regulation Number 2 Year 2012 on Buildings and Licensing; Yogyakarta Regional Government Regulation Number 2 Year 2012 on buildings; Average building height from the sample of 31 Evacuation buildings by PU.
The method of determining the distances from the shoreline in ArcGIS is creating buffers from the edge of the ocean polygon, using the certain distances from the classification (500m, 1500m, 2500, and over 2500m), which can be seen in the Figure 7.

Then the next step is selecting the entire buildings polygon that located inside each buffer and giving them graduated colors from red (the nearest from the shoreline) to green (farthest from the shoreline).

The result of Vulnerability of Building’s Distance from the Shoreline map can be seen in the Figure 8.

Figure 6. Vulnerability of Building’s Total Height.
Figure 7. Buffering the ocean polygon several times following the distance value in the classification.

Figure 8. Vulnerability of Building’s Distance from the Shoreline.
The last vulnerability factor is Population Density in the village level that will be represented by the buildings layer (Figure.9). The graduated colors are given to differentiate from the very high density village (red) to the very low density village (green).

![Figure 9. Vulnerability of Population Density per building in the Village Level of the Bengkulu City](image)

Source: BPS, 2011.

2.3. Risk analysis

The Risk Analysis is conducted by overlaying the Hazard Map with the three Vulnerability Maps and then a risk value will be given for each of these overlaid maps.
The calculation of the risk values can be seen in the details of Risk Value matrix as follows:

Table 4.a. Risk Matrix of Hazard versus Total Height Vulnerability.

<table>
<thead>
<tr>
<th>H / Total Height V</th>
<th>Not Dangerous</th>
<th>Loss Dangerous</th>
<th>Quite Dangerous</th>
<th>Dangerous</th>
<th>Very Dangerous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low Danger</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Low Danger</td>
<td>2</td>
<td>2 + 1</td>
<td>2 + 2</td>
<td>2 + 4</td>
<td>2 + 5</td>
</tr>
<tr>
<td>Medium Danger</td>
<td>3</td>
<td>3 + 1</td>
<td>3 + 2</td>
<td>3 + 4</td>
<td>3 + 5</td>
</tr>
<tr>
<td>High Danger</td>
<td>4</td>
<td>4 + 1</td>
<td>4 + 2</td>
<td>4 + 4</td>
<td>4 + 5</td>
</tr>
<tr>
<td>Very High Danger</td>
<td>5</td>
<td>5 + 1</td>
<td>5 + 2</td>
<td>5 + 4</td>
<td>5 + 5</td>
</tr>
</tbody>
</table>

Table 4.b. Risk Matrix of Hazard versus Distance Vulnerability.

<table>
<thead>
<tr>
<th>H / Distance V</th>
<th>Far</th>
<th>Quite Close</th>
<th>Close</th>
<th>Very Close</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low Danger</td>
<td>1 + 1</td>
<td>1 + 2</td>
<td>1 + 3</td>
<td>1 + 4</td>
</tr>
<tr>
<td>Low Danger</td>
<td>2 + 1</td>
<td>2 + 2</td>
<td>2 + 3</td>
<td>2 + 4</td>
</tr>
<tr>
<td>Medium Danger</td>
<td>3 + 1</td>
<td>3 + 2</td>
<td>3 + 3</td>
<td>3 + 5</td>
</tr>
<tr>
<td>High Danger</td>
<td>4 + 1</td>
<td>4 + 2</td>
<td>4 + 3</td>
<td>4 + 5</td>
</tr>
<tr>
<td>Very High Danger</td>
<td>5 + 1</td>
<td>5 + 2</td>
<td>5 + 3</td>
<td>5 + 5</td>
</tr>
</tbody>
</table>

Table 4.c. Risk Matrix of Hazard versus Population Vulnerability.

<table>
<thead>
<tr>
<th>H / Pop V</th>
<th>Very Low Density</th>
<th>Low Density</th>
<th>Medium Density</th>
<th>High Density</th>
<th>Very High Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low Danger</td>
<td>1 + 1</td>
<td>1 + 2</td>
<td>1 + 3</td>
<td>1 + 4</td>
<td>1 + 5</td>
</tr>
<tr>
<td>Low Danger</td>
<td>2 + 1</td>
<td>2 + 2</td>
<td>2 + 3</td>
<td>2 + 4</td>
<td>2 + 5</td>
</tr>
<tr>
<td>Medium Danger</td>
<td>3 + 1</td>
<td>3 + 2</td>
<td>3 + 3</td>
<td>3 + 4</td>
<td>3 + 5</td>
</tr>
<tr>
<td>High Danger</td>
<td>4 + 1</td>
<td>4 + 2</td>
<td>4 + 3</td>
<td>4 + 4</td>
<td>4 + 5</td>
</tr>
<tr>
<td>Very High Danger</td>
<td>5 + 1</td>
<td>5 + 2</td>
<td>5 + 3</td>
<td>5 + 4</td>
<td>5 + 5</td>
</tr>
</tbody>
</table>
3. Results

After conducting the Risk Analysis, the results of the three vulnerability maps for each of the vulnerability factor can be obtained. All of these vulnerability results can be combined into one Risk map showing an aggregated value of Total Risk Level of Tsunami in the Bengkulu City.

3.1. Total Risk Map

The total aggregated risk value of the three Vulnerabilities in the Bengkulu city can be obtained as follow:

![Risk Map](image)

Figure 10. Total aggregated value of Risk Level.
From the Total Risk result in Figure 10, it can be seen that most of the areas have Lowest/Low/Medium Risk, only small portion of areas in the Bengkulu City have High/Highest Risk (most of them located in the Very High Danger Tsunami Inundation Zones which also functioning as the coastal tourism areas).

3.2. GIS Analysis of 31 Evacuation Buildings and their Routes

In order to reduce the Tsunami Risk, the Bengkulu City has to provide several Evacuation Buildings especially in the High/ Highest Risk area.

In 2007, the Ministry of Public Works actually has already proposed as much as 31 evacuation buildings in the Bengkulu city. However, the method of choosing this buildings is only based on height and elevation. The distribution of those buildings can be seen in the Figure 11 below:

![Figure 11. The Distribution of 31 Evacuation Buildings to reduce the Risk.](image-url)
Table 5. List of Evacuation Buildings in the Figure 11.

<table>
<thead>
<tr>
<th>No.</th>
<th>Building Name/Type</th>
<th>Capacity (people)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>School</td>
<td>350</td>
</tr>
<tr>
<td>B</td>
<td>School</td>
<td>1050</td>
</tr>
<tr>
<td>C</td>
<td>School</td>
<td>825</td>
</tr>
<tr>
<td>D</td>
<td>School</td>
<td>500</td>
</tr>
<tr>
<td>E</td>
<td>Mosque</td>
<td>260</td>
</tr>
<tr>
<td>F</td>
<td>School</td>
<td>510</td>
</tr>
<tr>
<td>G</td>
<td>Marlborough Fort</td>
<td>750</td>
</tr>
<tr>
<td>H</td>
<td>Police HQ</td>
<td>950</td>
</tr>
<tr>
<td>I</td>
<td>Market</td>
<td>900</td>
</tr>
<tr>
<td>J</td>
<td>Mosque</td>
<td>380</td>
</tr>
<tr>
<td>K</td>
<td>School</td>
<td>750</td>
</tr>
<tr>
<td>L</td>
<td>School</td>
<td>400</td>
</tr>
<tr>
<td>M</td>
<td>Public work office</td>
<td>750</td>
</tr>
<tr>
<td>N</td>
<td>District office</td>
<td>325</td>
</tr>
<tr>
<td>O</td>
<td>Mosque</td>
<td>170</td>
</tr>
<tr>
<td>P</td>
<td>Dorm</td>
<td>100</td>
</tr>
<tr>
<td>Q</td>
<td>Great Mosque</td>
<td>1100</td>
</tr>
<tr>
<td>R</td>
<td>Mosque</td>
<td>140</td>
</tr>
<tr>
<td>S</td>
<td>Mosque</td>
<td>350</td>
</tr>
<tr>
<td>T</td>
<td>School</td>
<td>675</td>
</tr>
<tr>
<td>U</td>
<td>School</td>
<td>1450</td>
</tr>
<tr>
<td>V</td>
<td>Mall</td>
<td>1500</td>
</tr>
<tr>
<td>X</td>
<td>School</td>
<td>700</td>
</tr>
<tr>
<td>Y</td>
<td>Post office</td>
<td>200</td>
</tr>
<tr>
<td>Z</td>
<td>School</td>
<td>1800</td>
</tr>
<tr>
<td>AA</td>
<td>Government bld</td>
<td>600</td>
</tr>
<tr>
<td>AB</td>
<td>Governor bld</td>
<td>4000</td>
</tr>
<tr>
<td>AC</td>
<td>School</td>
<td>375</td>
</tr>
<tr>
<td>AD</td>
<td>Mosque</td>
<td>1000</td>
</tr>
<tr>
<td>AE</td>
<td>Council bld</td>
<td>1050</td>
</tr>
<tr>
<td>AF</td>
<td>Mosque</td>
<td>180</td>
</tr>
</tbody>
</table>

This research uses those 31 buildings as the reference and gives a more elaborate examination of GIS Analysis to find out the adequacy of the buildings.
3.3. Maximum Evacuation Distance

To determine the Maximum Evacuation Distance this research uses a method from The Guideline of Disaster Mitigation made by Japan’s Cabinet Officer of Disaster Management (Bousai, 1995) which has the model as follows:

\[ L_1 = P_1 \times (T-t_1) \]

Where:

- \( L_1 \) = Maximum Evacuation Distance
- \( P_1 \) = Average Walking Speed is ranged from 1.3 m/s ~ 0.5 m/s with the consideration of the elderly, infant, sick and people with special needs. So the assumed average of one person walking speed during evacuation situation \( P_1 \) is 1.0m/s.
- \( T \) = Approximated tsunami arrival time which is taken from the previous Aceh Tsunami in December 2006. In addition, there has been a study from Bandung Institute of Technology that conducted a survey after the Tsunami. From the study, it is obtained that the Tsunami Arrival Time Estimation is ranged from 15 to 50 Minutes. (Oetomo, 2005). However, this research uses 15 minutes as the fastest tsunami arrival time.
- \( t_1 \) = is the time needed to prepare an evacuation after earthquake occurs until the real evacuation. The references is taken from questionnaire on study case of 1993 Hokkaido Earthquake where the average needed is 5.3 Minute.

Using the assumptions above, the Maximum Evacuation Distance can be calculated and the GIS Analysis map can be obtained.

\[ P_1 = 60 \text{ (1 meter per second = 60 meter per minute)} \]
\[ T = 15 \]
\[ t_1 = 5.3 \]

\[ L_1 = 60 \times (15 - 5.3) = 60 \times 9.7 = 582 \text{ meters} \]
Figure 12. GIS Analysis Map of Maximum Evacuation Distance on 31 Evacuation Buildings.

The number code in the Figure above shown two parts separated by a “/”(slash), such as “138/446” which means the road length from previous node to the next node is 138 while total length of the road until end point is 446.

3.4. Maximum Capacity vs Potential Evacuees

The study result from the Ministry of Public Works has given information about the Maximum Capacity for each building that is used as the reference for this research. However, the more important element is the Potential number of evacuees that can
be obtained by calculating the number of residents that live in houses located inside the Maximum Evacuation Distance.

Figure 13. The number of people that potentially evacuate to one building and the fact of maximum capacity of that building may contradict.

Because, as shown in Figure 13, there is possibility that the Potential Evacuees Number is more than the Maximum Capacity of the evacuation buildings (this is called Under capacity). While the opposite condition is where the number of potential evacuees is less than the maximum capacity (Overcapacity).

The result of this GIS Analysis can be seen in the Figure 14, where it can be seen that as much as 18 evacuation buildings is still under capacity.
3.5. Adequacy based on Public Opinion

The last GIS Analysis is to find out the adequacy on these 31 evacuation buildings and their routes using questionnaires that were distributed to the citizens who live near the evacuation buildings.

The number of residents that were chosen as the interviewees are ten people per each evacuation building, therefore for 31 buildings the number of interviewees are 310 people. Ten people who are living near each corresponding evacuation building were randomly selected to fill the questionnaires.
Two of all the questions asked (Adequacy of Buildings and Adequacy of Routes) then changed into Pie charts in the GIS Analysis, which can be seen in the Figures in the next page.

Figure 15. GIS Analysis Map of Public Opinion on the Adequacy of the Evacuation Buildings.
3.6. Alternative Evacuation Buildings

From the GIS Analysis maps above, it can be seen that the existing evacuation buildings are not enough to cover the whole coastal area of Bengkulu City (shown by the white area in the maps). Even if an area was within the cover range distance to one of the evacuation buildings, from the maximum capacity versus potential evacuees above, there are 18 evacuation buildings that still under capacity.
To overcome this problem, some alternative evacuation buildings should be established. Regarding that, this research tries to designate 18 new alternative evacuation buildings in the Bengkulu City.

The detail of these new alternative evacuation buildings can be seen in the Table 6, below:

**Table 6. List of Evacuation Buildings in the Figure 17.**

<table>
<thead>
<tr>
<th>No</th>
<th>Buildings</th>
<th>Distance from shore</th>
<th>Height (m)</th>
<th>Elev (m)</th>
<th>Capacity (person)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mosque</td>
<td>141 m</td>
<td>5</td>
<td>1,2</td>
<td>427</td>
</tr>
<tr>
<td>2</td>
<td>School</td>
<td>567 m</td>
<td>15</td>
<td>8,5</td>
<td>1362</td>
</tr>
<tr>
<td>3</td>
<td>Office</td>
<td>728 m</td>
<td>10</td>
<td>10,7</td>
<td>380</td>
</tr>
<tr>
<td>4</td>
<td>Office</td>
<td>516 m</td>
<td>10</td>
<td>9,5</td>
<td>1412</td>
</tr>
<tr>
<td>5</td>
<td>University</td>
<td>686 m</td>
<td>20</td>
<td>10,5</td>
<td>1935</td>
</tr>
<tr>
<td>6</td>
<td>Bank</td>
<td>680 m</td>
<td>24</td>
<td>11,3</td>
<td>570</td>
</tr>
<tr>
<td>7</td>
<td>Fish Market</td>
<td>162 m</td>
<td>5</td>
<td>3,5</td>
<td>2215</td>
</tr>
<tr>
<td>8</td>
<td>Mosque</td>
<td>179 m</td>
<td>4</td>
<td>4,6</td>
<td>141</td>
</tr>
<tr>
<td>9</td>
<td>Field</td>
<td>632 m</td>
<td>0</td>
<td>9,7</td>
<td>568</td>
</tr>
<tr>
<td>10</td>
<td>Museum</td>
<td>635 m</td>
<td>5</td>
<td>11,9</td>
<td>1536</td>
</tr>
<tr>
<td>11</td>
<td>Office</td>
<td>561 m</td>
<td>5</td>
<td>10,4</td>
<td>1059</td>
</tr>
<tr>
<td>12</td>
<td>Hotel</td>
<td>206 m</td>
<td>10</td>
<td>4,6</td>
<td>2958</td>
</tr>
<tr>
<td>13</td>
<td>School</td>
<td>935 m</td>
<td>5</td>
<td>13,9</td>
<td>504</td>
</tr>
<tr>
<td>14</td>
<td>Mosque</td>
<td>428 m</td>
<td>5</td>
<td>7,6</td>
<td>183</td>
</tr>
<tr>
<td>15</td>
<td>Sport Centre</td>
<td>613 m</td>
<td>0</td>
<td>6,4</td>
<td>455</td>
</tr>
<tr>
<td>16</td>
<td>Office</td>
<td>981 m</td>
<td>15</td>
<td>12,5</td>
<td>1395</td>
</tr>
<tr>
<td>17</td>
<td>School</td>
<td>507 m</td>
<td>5</td>
<td>5,7</td>
<td>1098</td>
</tr>
<tr>
<td>18</td>
<td>Govt. Office</td>
<td>857 m</td>
<td>15</td>
<td>8,3</td>
<td>901</td>
</tr>
</tbody>
</table>
Figure 17. Distribution of 18 new alternative evacuation buildings.

After the establishment of these 18 new alternative buildings, the coverage areas of evacuation buildings are increase significantly and the previously under capacity buildings number are decreasing from 18 to 14.

4. Conclusions

This research tries to give a better analysis method of Risk Analysis for tsunami disaster in the Bengkulu City. Then in order to reduce the risk, this research examines as much as 31 evacuation buildings and their routes that has been proposed by Ministry of Public Works (PU), combined with various references from other researchers and processed the analysis using ArcGIS.

This research also proposes 18 (eighteen) alternative evacuation buildings than can be used to increase the evacuation coverage area in the Bengkulu City and to enhance the adequacy of the previous 31 evacuation buildings.
4.1. Recommendations

There are several recommendations addressed to Regional Government of Bengkulu City, in order to escalate the probability of evacuation survival: (1) Improvement of accesses for the evacuation buildings; (2) Conducting extensive research and simulation of tsunami loading into structures to discover accurate weaknesses and strengths of each evacuation buildings; and (3) Building expansion to increase the maximum capacity.

4.2. Study Weaknesses

There are several weaknesses that can be noted in this research, such as: (1) The Tsunami simulation scenarios used in this research is originally create for the Padang City, therefore it is not very accurate if used in the Bengkulu City; (2) This research used rough assumptions to determine the height of buildings in the city, therefore the analysis of Total Building Height is still imperfect; (3) The number of potential evacuees uses a rough assumption of 4 people in each building (2) and it ignores the possibility of people outside buildings; (4) The aerial photograph that is used as the reference for buildings is already out to date (2004).

4.3. Suggestion for Further Research

It is suggested for further researcher to research deeper in area of Disaster Culture (3) in Society and also to equip the tsunami mitigation system with the latest technology such as: The internet, social network, handheld telecommunication devices and such.

(2) Using rough approximation by Ministry of Public Works (PU) (2012);
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Latief, Hamzah; Hadi, Safwan; Suprijo, Totok; Ali, Moh.; Hassanudin; Ananta, Mipi; Gafar, Edi Z.; Riadi, Aditya. (2006). Pemodelan&Pemetaan Tsunami Serta KajianResikoBencana Tsunami Kota Bengkulu.LaporanPenelitian Sub Kegiatan: 4977.0582; PusatpenelitiianGeoteknologi, LIPI.


FARMER COPING STRATEGY TOWARD FARMLAND INUNDATION IN RURAL AREA: STUDY IN SOUTHERN PART OF KULON PROGO REGENCY

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Abstract
Many studies had been carried out related to coping strategy against the flood, but most of them had been done in urban area that cause the deaths and inundate settlements. However, there is hardly any research has been carried out about coping strategy for farmer in the rural context exist. For this reason, the research was conducted. Rural areas in southern part of Kulon Progo Regency are prone to flood inundation in farmland. This study aims to determine the rural farmer coping strategy against the inundation in farmland. The method used was survey research methods. Purposive sampling was used for sampling techniques. The respondents were farmers whose farmland inundated, amounting to 160 farmers. Data analysis used was descriptive analysis. The research result showed that the inundation in the farmland effect in damage to plants that makes the production was declining, especially if long inundation receded. To reduce the losses caused by farmland inundation, farmers done various coping strategies. Those strategies summarized in the three forms of coping strategies that are economic coping strategy, physical coping strategy and social coping strategy.

Keywords: Farmer household, Coping Strategy, Farmland inundation, Southern Part of Kulonprogo Regency

1. Introduction
Flooding is among the most damaging natural hazard. It is known that floods mostly affect community living in prone areas. Flood hazard can cause human activity disrupted by flooding, such as the destruction of agriculture land that caused income decline. Therefore flood hazard not only viewed as an appearance (phenomenon) only physical,

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but also a socio-economic appearance. Many studies had been carried out related to coping strategy against the flood, but most of them had been done in urban area that cause the deaths and inundate settlements. However, there is hardly any research has been carried out about coping strategy for farmer in the rural context exist.

Flooding especially inundation is a recurrent phenomenon in southern districts (District of Galur, Panjatan, Wates and Temon) of Kulon Progo Regency which is rural area. The agricultural sector is the main livelihood of the society. Flooding causes inundation in the fields. This induces the death of crops and crop failures because the crops ready for harvest or even newly planted crops. As a result is decreased agricultural crop production and farmers income. As the agriculture of the flood-prone areas suffers due to damage caused by the inundation, there is need a study in farmer coping strategy for information to facilitate in advance planning for risk reduction. This research will focus on the analysis of coping strategy of farmer household in Galur District (Tirtorahayu Village), Panjatan District (Kanoman Village), Wates District (Ngestiharjo Village) and Temon District (Kalidengen Village).

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According to Santosa (2010), Southern district of KulonProgo Regency has the morphology formed by the coastal alluvial plain also has the basin topography (Figure 1.). Moreover, those southern districts has problem in drainage system. The flood in this area mostly happened caused by drastic increase of the flow of drainage channel. With the high rain fall continuously, flood mostly happen in this area and inundated the agriculture land (Figure 2.).
Figure 1. South Java Flood Control Sector (River Basin) Project, 2007
Source: Public Works Office of Kulon Progo Regency, 2009

Figure 2. Flooded in Agriculture land, October 2010
Source: Public Works Office of Kulon Progo Regency, 2009
2. Literature Review

The literature review in this section is conducted in order to approach the concept, which are becoming the backdrop of this study. The review on flood inundation and coping strategy, broaden the acquaintance of this topic as well as helping in analyze the context of this study.

2.1. Flood Inundation

Flood is called a natural disaster, when they occur in area occupied by human. There are many definition of flood. Thus, defining a flood is rather difficult, partly because floods are complex phenomena and also because they are viewed differently by different people. Rossi et al., (1994) defined floods as extremely high flows or levels of rivers, whereby water inundates flood plains or terrain outside the water-confined major river channels. Rossi also described that alluvial flooding, is often associated with low flow-velocities in the overbank area, especially when they occur in the areas with low gradients, like alluvial and coastal plains. When flooding exceeds their normal limits or when people fail to adapt their land use, it can bring about a significant loss and damage to livelihoods by damaging crops, industry, commerce; disrupting education and other services; taking lives and displacing people (Abarquez & Zubair, 2004). So, inundation flood in this research context can be defined as a temporary water inundated in lowland agriculture area as a result of water overflow of irrigation channel and drainage channel that can cause loss and damage to livelihoods.

2.2. Coping Strategy

In a development context, several studies have documented that rural population have traditionally coped with crop failure by climatic conditions that vary within and between seasons by engaging in a multitude of alternative income and food sources, depending for the most part on local natural resources, including farmland, water and forests, and on social networks, household labour and capital, employment opportunities, and local skills and institutions (Eriksen et al, 2005). Coping with floods is defined as all those measures, with necessary policies and strategies of implementation, which a society may apply to alleviate the consequences of flood events. This may also include "doing nothing" except learning and adjusting to flood phenomena (Rossi et al., 1994). Rossi used flood hazard reduction as a synonym of coping with flood. Flood hazard reduction includes all measures that society may apply to prevent or mitigate flood damages (Rossi
et al., 1994). Coping strategy also the result of a process of people experiment and innovation with a sense of ‘safety’.

According to Guarin (2008), the coping analysis should also find how some strategies might undermine, weaken and eventually increase people’s vulnerability. Coping strategies are often transmitted from generation to generation within the communities and households (Marschiavelli, 2008).

Besides, Twigg (2004) stated that coping strategies by setting up ways of coping with disaster depends on the assumption that the event itself will follow a familiar pattern, and that people’s earlier action will be a reasonable guide for similar events. There are some categories of coping mechanism applied by community (Twigg, 2004) described below.

1. Economical /material; (such as economic diversification),
2. Technological; (such as the way that housing is adapted to repeated floods.).
4. Cultural strategies (including risk perception and religious views).

3. Method

The main objective of this study is to identify the coping strategies that used by farmer against farmland inundation. The four villages selected purposively were located in the most flood-prone area in southern part of KulonProgo Regency and were exposed to the farmland inundation annually. Those four villages are Tirtarahayu Villages in Galur District, Kanoman Village in Panjatan District, Ngestiharjo Village in Wates District, and Kalidengen Village in Temon District.

The study employed qualitative approaches for the purpose of triangulation. The concept of triangulation is based on the assumption that any bias inherent in a particular data source, investigator and method would be neutralised when used in conjunction with other data sources, investigator and methods. In-depth interview are probably the most used generally instrument of all. In this particular study, primary data was obtained by directly in-depth talking for the open question to the interviewees at farmer household level to get reliable and accurate information. Data was therefore collected through personal interviews from 160 farmer households purposively sampled. The respondents were local farmer households who lived in rural area which had inundated farmland.
4. Result and Discussion

Type of drainage channel in this area is secondary channel. That channel has the water quantity which is the accumulation from other channels. The flows from that channel will drain to the main channel or primary channel. The condition of drainage channel in most part of this research is not working properly when the heavy rainfall comes. It caused by broken wall drainage and clogged garbage. Broken wall drainage channel shown in Figure 3 while clogged garbage in drainage channel shown in Figure 4.

![Broken wall drainage channel in Kulwaru Village, Wates District](image)

**Figure 3.** Broken wall drainage channel in Kulwaru Village, Wates District

*Source: Personal documentation, 2011*
Flood occurs annually in this research area. Farmers’ learning is based on empirical observations and direct experiences. Farmer keeps to stay and working in inundated farmland because they have no other option since the land is their patrimonial land. Besides, when farmers who live in those inundated farmland are able to adapt to the changes of the surroundings, then those farmer will be able to continue to perpetuate their life. This is important to study the coping strategy adopted by the farmer in the study area since the result of inundation in farmland is decreased agricultural crop production and farmers income. This research tries to find coping strategy adopted by farmer based on Twigg (2004) classification: economical, physical and social aspects. During interviews, the people were asked, using open-ended questions, about their coping mechanisms. From fieldwork result, there were similiar coping strategies that used in four research area, Galur District, Panjatan District, Wates District and Temon District. The main reason is those area are the same rural area which has the same physiography located in the southern part of Kulon progo Regency.

**Economical Coping Strategies**

**Find Diversification of Occupation**

The definition of economic coping mechanism in the study area refers to the Twigg (2004) classification is economic activities and diversification, including those strategies
of the community linked to materials goods and resources. Research found for economical coping strategy is having more than one source of income. Economic diversification as the result from this research can be shown in Figure 5, that are process the treating pests that is paddy snails into the food, open a small kiosk for selling domestic needs, fish farming and animal husbandry (livestock) like cows, goats, dove, chickens, and ducks. This economical effort was undertaken by farmer because of reduced income due to crop failure. Moreover for marginal farmers such as hodge/farm worker, losses will be greater if they do not do any diversification because they are fully responsible for the farm. Even if they could harvest the crops after inundation, the selling price was set at a low level by “tengkulak” (local traders). So if the agricultural production declines, they will also experience a great loss.

Figure 5. A: Processing the paddy snails, B: open a small kiosk, C & D: fish farming and animal husbandry (livestock)

Source: Personal documentation, 2012
Physical Coping Strategies

“Surjan” system

One of physical coping strategy in this research area is to prepare the farmland with the "surjan" system (Figure 6). Results revealed that all respondents are farmers already cultivate their land with the "surjan" system. This system as a manifestation form of coping strategy of farmers in flood-inundation prone areas. This system also aims to gain greater agricultural output because by using the "surjan" system farmers can apply intercropping mechanism with different types of plants, especially crops “Palawija” and or vegetables.

Figure 6. Agricultur Land “Surjan”
Source: Personal documentation, 2011

Processing of agricultural land after flood

Another physical coping strategy of the respondents to cope with inundation in the farmland in addition to the processing system besides surjan is processing postinundation farmland. After inundation almost all the crops damaged and cannot be harvested. For partially damaged, farmers will do re-planting by pulling out damaged plants and replaced with new plants for the same type of the plants. Meanwhile, if the crops almost entirely destroyed, the farmer reforms and hoeing the land back to replace
with different types of plants. However, there are numbers of farmers who let their crops inundated and not doing any post-inundation process, and only started to grow after the next planting season. This is partly due to limited capital and manpower they have.

**Social Coping Strategies**

**Waiting for the next cropping rotation**

Crop rotation is a way of planting system according to a specific time during the year. This relates to the period from planting and harvesting time. Crop rotation in the study area conducted simultaneously for each group of farmers and should be adhered to each member.

**Choice of Plants**

In the strategy choice of plants, one thing to be considered is the season, because each plant has different levels to be able to live and thrive. For example chili that are usually planted in the research area is the type of local and non local chilli. Local chili suitable planted at the end of the rainy season, but still it rains. Local chili is more resistant to the water. In addition, although still planted on the time where it rains, production is still quite high. Non-local chili is more suitable to grow in the dry season. This is due to non-local chili does not resistant to the water, so if they planted in the rainy month, this type of chili will quickly decay.

**Cleaning The Drainage Channels**

Drainage channel in this area is secondary channel which the water quantity is the accumulation from others small channels, to be forwarded to the main channel or primary channel. To reduce the flood inundation, mutual help among farmers to clean the drainage channel is conducted. Farmers cleaning the drainage channel from waste (Figure 7) and weeds, *Eichhornia crassipes* working together with their group periodically (Figure 8).
Figure 7. drainage channel and garbage
Source: Personal documentation, 2011

Figure 8. Mutual help among farmers to clean the drainage channel from weeds, *Eichhornia crassipes*
Source: Personal documentation, 2011
5. Conclusion

The coping strategies that used by farmer in this research area (Galur District, Panjatan District, Wates District and Temon District) can be classified into economical, physical and social coping strategies. The strategies are Find diversification of occupation, Processing of agricultural land with “Surjan” system, Processing of agricultural land after inundation, Waiting for the next cropping rotation, Choice of Plants, and Cleaning The Drainage Channels. Farmers’ learning is based on empirical observations and direct experiences. Farmer keeps to stay and working in inundated farmland because they have no other option since the land is their patrimonial land. Besides, when farmers who live in those inundated farmland are able to adapt to the changes of the surroundings, then those farmer will be able to continue to perpetuate their life. They have found their own coping strategies that are likely to lie in synergistic union of nature and culture, so that the needs of both environment and people are not the problems. Assisting farmers to interpret what is happening in their fields by referring to their recent practices and outcomes, past learning, and their fellow farmers’ strategies and crop performances, is a way to enrich their knowledge and coping strategies in the way of risk reduction.

References


EXPLORING SOCIAL CAPITAL ROLE TO RESTORE COMMUNITY RESILIENCE AFTER WEST JAVA EARTHQUAKE: CASE STUDY PANGALENGAN SUB-DISTRICT, BANDUNG REGION, WEST JAVA

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Abstract
As a country that is located in ring of fire of Asia Pacific Region, Indonesia has been prone to earthquake risks. The impact does not only hamper the physical condition, but also impacts the social aspect, such as socio psychology characteristics: trauma, panic, hopeless, depressing, socio-economy: (displacement, migration, and livelihood changes), as well as socio-political (conflict, perceptions and distrust to the municipality). To restore these conditions, apart from physical recovery, social recovery needs to be carried out. This paper examines the impact of West Java Earthquake (2009) to the people living in Pangalengan Community, Bandung District as the area that was largely affected by the earthquake. Methodology of this study is a qualitative analysis, such as content analysis and in depth interview to the victim of earthquake, government and non-governmental agencies. Field observation and literature review was conducted to review the issues and further information in order to complete the data that has been collected. While the earthquake has passed out for four years, post disaster recovery process is still taking place, but the achievement of social recovery, as one of the main problem, has to be resolved. This paper found that the government focused much on physical recovery through housing and infrastructure reconstruction, while other social problems remain. This paper argues, to rebuild communities, social capital support in community needs to be developed. This is through the involvement of both formal and informal leaders that exist in the study area, the social networks and the social channels: religious and cultural activities. Identification of social capital in the study area has the potential to speed up the unsolved of social recovery process and rebuild toward a better society.

Keywords: West Java Earthquake, Rebuilding, Community, Social Capital

1. Introduction
Insufficient knowledge of local communities affected by disasters and their capacities is one of the major factors in poor humanitarian response – often compounded by humanitarian actors’ resistance to asking affected populations what they need instead of making their own assumptions. However, most important determinant of the likely need of the population is based on a social understanding of the population. The needs of the population depend in part on their resources and practices and on how the affected population is organised. While rich communities that have significant resources may have less

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need of assistance, communities that are well organised with strong social structures are better able to deal with disaster impact than communities with weak social structures. For example, Vietnamese community in Village de L’est, New Orleans, showed a community with deeper connections which stay in touch during and after the disaster are more likely to work together to rebuild their neighbourhoods (Aldrich, 2008).

West Java is one of area that is prone to earthquake risk. This situation has been influenced by the complexity of geology structure. For instance, an Earthquake hit the southern of Tasikmalaya District, West Java Province, on 2nd of September 2009 by a magnitude 7.3 Richter scale. The impact of earthquake affected many sectors, such as housing, infrastructure, social and economic sectors. This earthquake event resulted 81 people were killed, 1,287 people were injured, 196,107 people were left homeless and 260,765 houses were damaged. The earthquake caused an estimated Rp 7.9 billion or US$ 8 million in damage which the worst damage and loss suffered by the housing sector with total damage and losses of Rp 6.9 billion or US$ 7 million (Bappenas, 2009). The fifteen districts and/or cities in West Java Province are affected. The worst impact of West Java Earthquake was in Bandung district which has 23 people were died, over 771 people were injured and 51,102 houses were damaged (Bappenas, 2009). Pangalengan sub-district is one part of Bandung district area that got the worst impact by the earthquake (Malik, 2010). In this area, there were approximately 46,000 Internally Displaced Person (IDP) 1,810 houses were destroyed, 6,375 units were severely damaged, and 13,730 were minor damage units (Bandung District Disaster Management Task and Coordination Force, 2010).

In Pangalengan sub-district, process of recovery after the earthquake has been done for almost 3 years. However, that duration is not enough to recover social aspects in society. Unlike, physical and economic recovery could take a couple of year; social recovery needs more time to solve it. Those stakeholders who are involved should have deeper understanding about modal social and ways to recover society after the earthquake event (Aldrich, 2008, Vanhoebrouck and Sagala, 2010). A better understanding of disaster social impacts and its recover can provide the development of recovery plans to prevent long-term consequences from occurring (Lindell and Prater, 2003). It is important because effective recovery from disasters not depend just on physical impacts of the event but also on how the social environment supports the complex and protracted process of recovery (Gordon, 2004).

Unfortunately, social recovery process after West Java Earthquake is not easy. There have been lacks of data that provide information about social recovery in West Java community since the implementation phase of action plan finished in the end of 2011 (Wimbardana and Sagala, 2012). The only one of social recovery data in West Java community is a community recovery service of psychosocial and economic household for earthquake victims that held by Badan Penanggulangan Bencana Daerah - BPBD (Regional Disaster Management Agency) of West Java and Institut Pertanian Bogor - IPB (Bogor Institute of Agriculture) in 2011. This report shows that not all community in affected area received it; include Community of Pangalengan Sub-district, whereas they are the highest number of victim. This condition is one of obstacle in social recovery process in Pangalengan Sub-district.
This study focused on social impact that was happened on Pangalengan community and how the role of social capital embedded in the community can influence social recovery after West Java Earthquake in Pangalengan Sub-district. The purpose of this study is to identify social capital role that support the effectivity of social recovery process after earthquake event. Firstly, this study explains about the impact of West Java Earthquake in Pangalengan Community. Secondly, this study explores how developing social capital in social recovery process. It is important to identify the role of social capital can support social recovery after earthquake event. Finding of this study can be used to describe the form and process of social capitals which were developed in Pangalengan Community while social recovery occurred. Finally, the conclusion of this study is recommendation that function to stakeholder that associate with this study and as input to continue the research that relate to social recovery after earthquake.

2. Social Capital Framework
2.1 The Concept of Social Capital

Social capital, in general, refers to the trust, social norms and network which affect social and economic activities. Supporters of this new concept believe that the level of trust, social norms and networks can be measured and a high accumulation of such capital contributes significantly to social, political and even economic performance, for better or worse (Nakagawa and Shaw, 2004). Coleman (1988) defined social capital by its function. Social capital is not a single entity but a variety of different entities, with two elements in common: they all consist of some aspect of social structures, and they facilitate certain actions of actors—whether persons or corporate actors—within the structure. Then, Putnam et al. (1994) explained that social capital is the important aspect for government performance and the level of civic-ness that reflected in economic performance. They were of the view that social capital is the set of horizontal associations, including norms and civic engagements, which they measured using four indicators: newspaper readership, number of sports and cultural clubs, turnout in referenda, and incidence of preference voting.

Woolcock (1998) defined social capital into three categories: 1) Bonding social capital (ties between immediate family members, neighbours, close friends, and business associates sharing similar demographic characteristics); 2) Bridging social capital (ties among people from different ethnic, geographical, and occupational backgrounds but with similar economic status and political influence); and 3) Linking social capital (ties between community and those in positions of influence in formal organizations such as banks, agricultural extension offices, schools, housing authorities, or the police). He observed that poor people tend to have strong bonding social capital and some level of bridging social capital, but little linking social capital, which is the most important for betterment of the economic environment. For instance, during natural disasters or crop failure resulting from sudden climate change, bonding and bridging social capital might work as a very fragile safety-net. However, to eliminate vulnerability of livelihood and make a safer and sustainable environment, linking social capital plays a critical role.
In brief, social capital as the function of mutual trust, social networks of both individuals and groups, and social norms such as obligation and willingness toward mutually beneficial collective action, which is, in this paper, the post disaster recovery process. This social capital will be facilitated and/or enforced by trust for community leaders and also by the political maturity of the community. Political maturity means that the community is accustomed to consensus building by having meetings and discussions among community members.

2.2 Social Capital as part of Social Recovery Process

Disaster management has divided into two parts: Mitigation (Risk Analysis, Prevention and Preparedness) and Response (search and rescue, humanitarian assistance and rehabilitation and reconstruction) (Arya, 2003 in Nakagawa and Shaw, 2004). Risk Analysis includes hazard and vulnerability assessment and risk assessment; Prevention includes both structural and non-structural measures; and Preparedness includes warning, planning and policy, etc. All these elements are reflected in the cyclic process, popularly known as the Disaster Cycle (Nakagawa and Shaw, 2004). In Indonesia, Disaster Management Policy, as observed in many situations, focuses mainly on the physical part of the vulnerability, and social aspects are often missing. Consequently, the reconstruction plans following major disasters focus mostly on the physical recovery and more visible impacts, and the plans often lack attention to social recovery.

When the whole society system is disrupted by disaster event, then the burden of recovery will be huge and the need of social and community psychology emerged as a concern. This makes it possible to identify the area that will be focused on social recovery and community psychology. Some people had worse condition than others and usually it happened in low-income groups. Damage to infrastructure and public goods caused the group lose access and social facilities. Therefore, the psychology recovery needs to restore the psychological condition of the victims after the earthquake event. There are some levels of psychology recovery. First, psychology recovery has to involve the proper, reliable and professional counselor. The role of counselors are as facilitator and mediator between community and government (Olshansky et al., 2006). Second, it needs to have list of the counsellors and make a plan to trauma healing. Training for counsellor at emergency and recovery phrase is necessary because they are someone who assists the disaster victims in recovery process. Hence, the post-disaster counsellors should be sensitive to local culture so counsellors can act appropriate for local wisdom. Importantly, the function of counsellors should be seen as a positive opportunity to stimulate local people to develop and understand how to act properly while they face the situation after disaster event. Relation between counsellor and local people can be a way to exchange their experience, whether about daily life or disaster situation (Olshansky et al., 2006). Thus, their capability for managing disasaters will increase.

Recently, various studies have sought to link the speed and effectiveness of the process of recovery to levels of trust and social capital—that is, the resources available to individuals through their social networks (Lin, 2008). Mechanism of
social capital that can influence social recovery after disaster events is indicated from social network in neighborhood. Social network present “informal insurance” that can support the victim to solve the financial and logistical problem (Aldrich, 2010). In addition, social capital can be the way in society to undertake collective action and enhance their social network to articulate their demands to authorities and work together to overcome obstacles to recovery (Aldrich, 2010).

There are some examples about recovery process after disaster events in various countries. It shows evidence that the existence of social capital in social recovery process in society. In the Kobe earthquake case, the role of social capital at the ward—not just individual—level became apparent during the creation of neighborhood-based civil society organizations. Following the earthquake, a number of wards within the city of Kobe established new Non Profit Organizations (NPO) to organize and coordinate recovery, neighborhood activities and long-term planning. The NPO focused on providing assistance solely to individuals within their jurisdiction to develop their ward and serve as a prime example of institutionalized social capital at the neighborhood level. In the Aceh and Nias earthquake and tsunami case in 2004, there is local system that has full right to organize the broader region, called gampong. It is traditional system in Aceh. Gampong is basic social organization that is recognized as a government organization. Every gampong has one place that function as a place to pray, discussion, gathering, development of art, sport, and the administrative center of village, which called Meunasah. Therefore, the function of meunasah is as central point of development Acehnese. Furthermore, in Jogjakarta earthquake case, there are many community committees, called pokmas. Pokmas is kind of forum for community discussion. When the recovery period is still ongoing, every pokmas has group facilitator as mediator to assist them in the recovery process. In addition, other community activities, such as gotong royong, arisan (fund raising), Pembinaan Kesejahteraan Keluarga, PKK (Women’s Family Welfare Movement) in one area show the important of community activities to gain their relation while recovery process. Thus, it shows that recovery process not only to rebuild the damage houses but also to develop the safer neighborhood from disaster event and to build up the resilience in community.

3. Methodology

3.1. Study Area

Pangalengan Sub-District is a highland area (1400 m) where it is located in southern part of Bandung District, 40 km from capital city of West Java Province, Bandung. It has 13 villages: Wanasuka, Banjarsari, Margaluyu, Sukaluyu, Warna'sari, Pulonari, Margamekar, Sukamanah, Margamukti, Pangalengan, Margamulya, Tribaktimulya, and Lamajang, where they are surrounded by four mountains: Mt. Malabar (2,321 m), Mt. Wayang (2,182 m), Mt. Windu (2,054 m), and Mt. Tilu (2,042 m). According to the Badan Pusat Statistik – BPS (Centre of Statistic Agency) Bandung District in 2010, the population was 146,578 and population density is concentrated in Pangalengan and Sukamanah Village. Pangalengan Sub-District area (27,294 Ha) has characteristic of rural area which the majority of inhabitant’s occupations are
farmer and it is popular agricultural area with milk, tea, and coffee for economic primary production in West Java area. There are also several private industries related gasoline and geothermal mining in Pangalengan Sub-District.

West Java Province is prone to tectonic stress on region offshore and on the land of Java, thus causing the formation of earthquake to fault zones to accommodate the plate movement (Abidin et al., 2009). There are three active faults in mainland of West Java, namely Cimandiri, Lembang and Baribis faults and it is located near subduction-zone of Australian-Oceanic plate in the southern part. There is several large earthquakes happened in West Java. The 2006 Pangandaran Earthquake triggered a tsunami wave and it hit along southern West Java coastal area. On 2nd September 2009, an earthquake shook West Java by a magnitude 7.3 Richter scale. The most devastated significant damaged area is Bandung District and Tasikmalaya District where the epicenter of earthquake is located near southern part of Tasikmalaya on region offshore (Bappenas, 2009).

Our research took in four villages: Sukamanah, Pangalengan, Margamulya, and Margamukti. Those villagers suffered housing units damaged heavier (Margamukti: 1,631 houses, Sukamanah: 4,028 houses, Pangalengan: 4,231 houses, and Margamulya: 2,521 houses) than others village in Pangalengan Sub-District that caused by the 2009 West Java Earthquake. They are also the highest density area in Pangalengan Sub-District area and they are passed by Bandung – Garut main road.

![Figure 1. Percentage of Homes Damaged](https://example.com/figure1.png)

*Source: Modified from UNOCHA (2009) and Bandung District Disaster Management Task and Coordination Force (2010)*
The current study wants to understand how the most suffered community can recover from their social impact, so we chose those villages.

3.2. Data Collection and Analysis

To understand social recovery process within Pangalengan community from the 2009 West Java earthquake event that had not been discovered before, our research applied qualitative survey by in-depth interview to the members of community, NGOs, and local governments who involved into the social recovery process in Pangalengan community. The rationale reason our research applied qualitative study because it shares a common flexibility and deep understanding about what is happening in a setting or how the participants perceive of their world. It was considered because some regions may be more or less susceptible to the impacts of hazards than other places based on the characteristics of the people residing within them (Cutter and Emrich, 2006). Each community also has different ways to recover from their impact which they can recover quickly or slowly (Aldrich, 2008).

This research applied macro level approach where the information sources were based from mass media (online, local, and national newspaper), studio survey report which it conducted by undergraduate students of ITB Urban and Regional Planning program in Pangalengan Sub-District on 23 - 28 April 2012, and governmental documents (Fife, 2005). Governmental documents include The Post-Earthquake Disaster Action Plan for Regional Rehabilitation and Reconstruction in West Java Province and Cilacap Districts in Central Java Province by Bappenas (2009) and Psychosocial and Economic Assistance for the 2009 West Java Earthquake Victims Report by IPB and BPBD of West Java. Micro approach data gathered through field observation and in-depth interview. On 1st March 2012, a preliminary observation of the area was conducted for understanding of the specific locality and social situation information after the earthquake event. In this preliminary observation, we interviewed a NGO official, village officials, and local community members. They were very helpful to discover early finding about social impact of Pangalengan community and their approach to recover from it. Their information was useful to set a semi-structured interview for the field work. Primary data collection method is conducted on 8 - 10 May 2012 through in-depth interviews and field observation.

Our research explores the social impact of Pangalengan community that caused by the earthquake disaster. Further, we related the numerous social impacts within Pangalengan community based on at-risk group (Morrow, 1999) and their vulnerability characteristics by Morrow (1999) and Cutter et al. (2003). Purposive sampling technique was used to discover social impact within Pangalengan community members that caused by the earthquake event in 2009. The participants were chose from social group in Sukamanah, Pangalengan, Margamukti, and Margamulya Village who reflects highly vulnerable characteristics. We also consulted with local leaders and leader of village officer to recruit potential participants in each village. Recruitment strategies are determined by the type of at-risk group and characteristic of earthquake victims in their reports. Unfortunately, we
could not find all of at-risk group because there was lack of information about their existence in each village from our key informants as well as we looked for them alone then. For the result, we found several at-risk groups: elderly (n = 8), children or youth (n = 8), poor household (n = 24), large household (n = 24), and single parent household (n = 12).

The interviews were semi-structured, open-ended, and directly related to main information which gave the interviewees more freedom to narrate their experience with flow. In-depth interviews were recorded by tape recorder and systematically arranged in transcript then. Because of the broad nature of the qualitative data, a sorting process followed, with segments of each interview placed in various content categories. We did a triangulation of different data resources, because it may also enhance the quality and reliability of the data. The qualitative data analysis focused on the content of participant statements. The final goal is to combine information patterns into wider and more objective analysis patterns.


Lindell and Prater (2003) categorized social impacts into three parts, such as social psychology, socioeconomic and social trust. Despite difficulties in measuring the social impacts, it is nonetheless important to monitor them because they can cause significant problems for the long-term functioning of specific types of households and businesses in an affected community (Lindell and Prater, 2003). Psychosocial impact includes fatigue, gastrointestinal upset, confusion, impaired concentration, attention deficits, anxiety, depression, and grief. They also include behavioural effects such as sleep and appetite changes, ritualistic behaviour, and substance abuse. There are population segments requiring this special attention. These include children, frail elderly, and people with pre-existing mental illness, racial and ethnic minorities, and families of those who have died in the disaster (Lindell and Prater, 2003). The main socio-economic impacts of disasters are direct economic losses in damaged properties or assets (Lindell and Prater, 2003). Because of the destruction of household dwellings, They have to face many problem during they build back their house, such living in temporary shelters, logistic and aid distribution problem, living in temporary house with non-preferred location and structures, and limitation of resources for building back permanent house (Lindell and Prater, 2003). There are also an increase number of emigrations of population segments that have lost housing (Cutter et al., 2003). Last impact is social trust. Lose of assets and lack of empowerment to articulate their need after disaster event emerged netwok problem among communities.

Social recovery appears to recover social impact that happened in disaster victims. Resources used in social recovery came from the effort of disaster victims, NGOs’ assistances and government’s assistances (extra-community assistance) (Lindell and Prater, 2003). While social recovery is ongoing, social capital plays important roles in restoring post-disaster social impacts. The existence of social capital emerge as
social ties in the neighborhood and social network between local people and government or NGOs (Aldrich, 2010).

4.1. Social-Psychology

In Pangalengan Sub-district, various attempts have been made to reduce social impacts in community, such as traumatic after West Java Earthquake in 2009. To restore this impact, various NGOs act as facilitator among disaster victim during post-disaster recovery. NGOs that involve reducing social impact are Hope Asia Foundation, IBU Foundation and Rotary Club. Hope Asia Foundation is one of organization that concern in social aspect. In West Java Earthquake case, Hope Asia Foundation helped to heal the traumatic on children and the elderly in counseling way. To do that, Hope Asia Foundation provides resources and recruits some students from School of Social Welfare (Sekolah Tinggi Kesejahteraan Sosial, STKS, Bandung) as volunteer. Until now, Hope Asia Foundation has an office which is organized by STKS' students in Sukamanah Village. Then, when post-disaster recovery period, another NGO that involved Pangalengan community to reduce their trauma is IBU Foundation. IBU Foundation used trauma healing method. Targets of this method are children and the elderly. In addition, Rotary Club involved in post-disaster recovery by provided daily needs when emergency phrase and built public library that located in Margamukti Village’s office. NGOs which were contributed in social recovery process in Pangalengan Sub-district mostly used trauma healing method and games to reduce the trauma in disaster victims.

Furthermore, the presences of community leaders and caders in neighborhood, like PKK, or local organization have a role to restoring feelings of trauma in society. Sense of responsibility that emerged in community leader became resources to assist people in their environment facing difficult times after the earthquake.

"I am as neighborhood leader, has responsibility to my community. Because of that, I usually give some advices at least every night when we stayed at temporary shelters." Man. 34. Elderly. Margamukti Village.
The existence of community leaders can be one of capacity and social capital which appear during social recovery process (Barakat, 2003, Sakamoto and Yamori, 2009) with using interpersonal approach or community approach in society. Unfortunately, the relationship between community leaders and NGOs that involved in post-disaster recovery, have not been seen in Pangalengan community.

4.2. Socioeconomic
After West Java Earthquake in 2009, mostly, Pangalengan community’s loss were not only their houses, but also their saving and assets because of the destruction of household dwellings. This situation enforced them to migrate to another area which safer than before. This feeling was reinforced by the trauma. However, they have limitation with their capacity and opportunities, so they are very hard to leave their place. Further there are almost no more options to move their house location if they still survive in their each study locations. For that, people tend to re-build their houses in the same location or at least next to the remnant of their damaged old building which cannot be totally cleaned.

"Soon after the earthquake, there is a strong desire to move out from Pangalengan. It is caused by how such big impacts that we had received by the 2009 earthquake. But in line with the running time, that feeling disappear significantly because we finally realize with our limitation of financial and capacity-opportunity to get work." Beneficiary (Source: Yasaditama and Sagala, 2012)

Solution for this condition, in 2011, government actually had provided a permanent relocation place not far from the current location. The choice of location is had been preceded by the study so it must be safer than the previous location. However, some refugees are not willing to be moved to the new location and keep stay in previous location. They assumed that the location is less access and steep in some area, so it has potency for landslide in the future. According to some informants, this situation is more because there were some decisions maker were took in hurry condition and they not involved targeted people.

"Actually, our land has been preceded through an initial review and study, even the provision of the settlement facilities and infrastructures has also been planned at that location. Indeed, in many times we had ever been recommended or even accused by some sides to immediately provide the permanent location." Pangalengan Sub-District Secretary (Source: Yasaditama and Sagala, 2012)
Conflict that arises in Sukamanah Village, Pangalengan Sub-district is a result of the lack of involvement of local communities in the recovery process. Government seems ignored social impacts arising in the community. In addition, the lacks of knowledge about the disaster in the community also influence the relocation process. Communities are preferred to choose the safe resident and able to support the economic activities of their households. In the new location, the people need a longer time to get to their workplace. The absence of community leaders and facilitators who understand the problem resulted in no coordination between the community and government, so that people and governments had their own assumption of the actions and could not get consensus between them in effort to resolve post-disaster recovery problem.

Government also provided financial assistance for the victims to rebuild their houses which were destroyed by earthquake. Each level of government used their budget that allocated for post-disaster recovery process. Then, Regional Agency which concern in Disaster Management (Badan Penanggulangan Bencana Daerah, BPBD) has worked with Department of Housing, West Java Province to recruit community to become the facilitator in areas which were destroyed by earthquake to assist the disaster victims while housing reconstruction process. People who were recruited as facilitator came from individuals who have expertise in the field of construction. After recruitment, the facilitators will be trained as foundation before they involve in disaster area. The materials which were gave to the facilitators are administrative procedure, so they will understand to distribute the financial assistance first before they help the disaster victims. The responsibility of the facilitators is to prevent social conflits which can occur when the distribution of housing assistance.

When period of aid distribution were occurred, based on the Action Plan of Post-Disaster Recovery after West Java Earthquake in 2009, government gave mandate to make community groups (Kelompok Masyarakat, pokmas) in each village in order to assist the aid distribution. Pokmas were created by Bandung District’s Decree which has procedure of the form of pokmas. Each pokmas consist of one leader, treasure...
and 10 – 15 family as members. All of member of pokmas should be the disaster victims. To choose the leader of pokmas, each village has their own way. However, some people are willing to be a leader because of their own reasons.

“I am willing to be a leader of community meetings (pokmas) because I have good education or a leader in this neighborhood.” Leader of Pokmas. Pangalengan Village (Source: Lutfiana and Sagala, 2013)

Pokmas was made to help government to create the category of the level of damage houses. Applied mechanism is with dividing the impacted people into three categories based on high level of damaged house, namely heavy damaged, moderate level and minor damaged. Further, each victim has different amount of received financing assistance based on their level of housing damaged: (1) Heavy damaged house victim got Rp 15,000,000, (2) Moderate damaged house got Rp 10,000,000, and (3) Minor damaged house got Rp 1,000,000 (Bappenas, 2009). The funds were distributed from government to pokmas’ treasurer. While distributing the housing aid from the treasures to the members, facilitator as community assistant, should help them to prevent the conflict. Facilitators have control functions for pokmas to ensure and be responsible for the housing aid distribution. Then, the facilitators should report their activities to District and Province Government by accountability report.

"The distribution of financial assistance used Pokmas. Treasurer of Pokmas took the money and gave it to Pokmas’ Leader. After that, the leader will give the money to each member.” Man. 52. Elderly. Pangalengan Village.

Limitation of financial assistance became the main problem in disaster victims. Then, the phrase of funding distribution was divided into two phrases. First phrase was aimed to the minor damage house and half of moderate damage house that were started 9 months after disaster. The second was aimed to the half of moderate damage house and heavy damage house that were started 15 months after disaster. For disaster victims, those phrases were worked too slowly for funding distribution because they wanted to rebuild their houses as soon as possible. Although the funding distribution was too slow, some people still prefer to rely on government’s and NGO’s assistance to rebuild their house. It happened because of the financial limitation and the absence of assets. On the other hand, some people chose to use their saving and/or borrow the money from their relatives and not to hope to government’s assistance to rebuild their houses. In these issues, the role of facilitators did not appear in the way to fix the problem because they have not authority to take decisions on government’s policy.

"We cannot build a house by half to half, how could it be? for example in phase 1 we build wall first, then in phase 2 a few months later we had already added our house with a roof. In other side we also cannot continue for more time to wait in refugee camps because we cannot did our activities normally. To anticipate this, we sometimes borrow amount of money from relations and also as could as possible to set apart our income”. Beneficiary (source: Yasaditama and Sagala, 2012)
Those cases indicated that existence of social capital in society was showed by the function of *pokmas* and the ability of society to use social network for fixing the problem. *Pokmas* was considered to be a place to discuss and share information about housing reconstruction. Besides, the presence of trust in *pokmas*’ members to their treasurer who in charged of receiving money showed social capital in Pangalengan community. They trusted that their treasure would give them the money properly.

### 4.3. Social Trust

In the recovery process, especially logistic distribution process, some people did not trust with government and local leader. Mechanism of the aid distribution should be reported to local leader before they distributed to the refugees. However, some people did not receive the aid or get improperly. They thought that local leader prioritized the aid distribution to their relatives first, then to the refugees. There is a conflict when people did not agree to be moved to the area which was provided by government and keep stay in the previous area as we discussed in socioeconomic section. Another conflict was found when people were dissatisfied with the nominal and the distribution of financial assistance.

Then, there was misperception among the community and the government in post-disaster process. Inability to articulate the community needs to the government and vice versa can be a trigger for social trust impact. One way to decrease this problem is the role of government as the main actor to control it. Government has important role to collaborate with other stakeholders, such as communities, NGOs and private actors. Conflicts normally occur when there mis-understanding and not clear collaboration and agreement between actors. In Pangalengan case, the collaboration between actors did not appear in post-disaster recovery, especially, collaboration between government and NGOs who involved the social recovery process. Government was limited to authorize and record the NGOs involved. Beside that, the function of facilitators who were recruited by government could not be mediator between community and government in giving solutions.

### 4.4. Social Capital Form in Pangalengan Sub-District

In this section, we focus on social capital prevalent within social recovery process after West Java Earthquake in Pangalengan District as it was considered to be one of the most important factors influencing social recovery process. This study shows that the form of social capital which emerged in social recovery process in Pangalengan Community is human network. Social ties that were developed in society can serve as “informal insurance,” allowing victims to draw upon ready-made support networks for financial, physical, and logistic guidance(Aldrich, 2010, Sakamoto and Yamori, 2009, Nakagawa and Shaw, 2004). In Pangalengan case, the social capital’s form has shown by the presence of local leader, *PKK* or the volunteer that helped in social recovery process whether in interpersonal approach or collective action.
Social capital was developed not only because of the interaction among community continuously but also the similarity of condition as the catastrophic victims in society (homogeneous background) (Sakamoto and Yamori, 2009). Then, the similarity of financial background and the length of stay in the same neighbourhood among the victims can influence the relation or interaction between them. The more closely relationship in society can foster a sense of belonging and stronger level of trust within the community. These conditions trigger a sense of mutual need and mutual help to improve their condition after earthquake disaster. Continuous interaction can build the strong social bond. It can influence the speed and effectiveness of social recovery process.

5. Conclusions

This study discuss about social impact that happened in society and the role of social capital in Pangalengan community after West Java Earthquake. Social impacts consist of social psychology, socioeconomic and social trust impact. Recovery processes were done by various actors, such as society, government and NGOs. The assistance and aid provided by government and NGOs increased gradually when recovery period was occured. However, community cannot rely on the assistance all the time. Therefore, they should struggle to restore their condition whether to the previous condition before disaster or better. In that case, social capital have important role in society.

The form of social capital which was developed in Pangalengan Community is human network. The existence of local leader and the caders become the main actor to support society to build back better after disaster event. The local leader is one of the important factors which determine the effectiveness of social recovery. It can use optimally with the facilitators. In addition, the facilitators should have a good understanding about local people and the neighborhood, whether about the social network or the interaction. It can increase the level of trust between facilitators and local people. Thus, this situation can create a good collaboration among the actors, so social recovery could be happened effectively.

Acknowledgement

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References


NETWORKS AND ROLES IN VOLCANO BASED TOURISM DEVELOPMENT
Case Study: Merapi Volcano Tour

Alpian A Pratama¹, Saut Sagala¹,
Adenantera Dwicaksono¹, Ramanditya Wimbardana¹,

Abstract

The pyroclastic flow of Mount Merapi eruption in 2010 has led many damages to livelihood and other activities to people settled around Merapi, including demolishing two villages in Cangkringan Sub District, Yogyakarta. However, this physical damage generates people to come and becomes a tourism attraction. Therefore, it becomes an opportunity for local people to conduct tourism on the ruined villages. This study is motivated on the way community organizes and manages its potential as a way for alternative livelihoods. Community has high role for acquiring resources together through the establishment of tourism area. Formal, informal leaders and the follower’s interaction have become the sources of capacity in the tourism management. This process is worth for studying and potential replication in other area while considered limited in its achievement. This paper examines to what extent the role of each actor in their interaction and networking in organizing and managing Merapi Volcano-based tourism development. The research utilized applied qualitative research methods such as interviews with actors and key informants. The data were collected from interview are analysed using Ucinet16.0 Software to illustrate the visualization interaction between actors in tourism. The finding shows that local tourism management organization and head of each association are major actors even though the formed of interaction is not optimal yet. This paper recommends involvement of other actors, such tourism department and local government to be involved in the Volcano-based tourism management. This partnership between involved actors will better provide sustainable tourism.

Keywords: actors, interaction, Merapi, social network analysis, tourism, volcano, Yogyakarta

1. Introduction

Networks create social capital for communities (Putnam, 2000, Portes and Sensenbrenner, 1993). Moreover, collaboration is important for the affected communities who have limited capability to repair their condition due to their limited source (Coppola, 2006, Glantz, 2000). Previous study has examined that communities’ network can provide help during a pre and post disaster (Vanhoebrouck and Sagala, 2010). Therefore, Indonesia is a country that is prone to natural disaster impacts; Indonesia has been highly affected by many disaster events. However, this

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physical damage generates people to come and becomes a tourism attraction. Sagala et al. (2012) on previous study in Mount Merapi mentioned that tourism activity is an alternative livelihood after 2010 eruption. Therefore, this study is motivated on the way community organizes and manages its potential as a way for alternative livelihoods.

Volcano tourism can be categorized as a dark tourism. Normally, the strength of the dark tourism depends on two main things: the scale and the time when the event occurs (Petford et al., 2010). Most of the volcanoes are inhabited since they offer many sources of economy to the inhabitants (fertile land, cold climate, tourism). (Tobin and Whiteford, 2002). Tobin and Whiteford (2002) and Lane et al., 2003 research on Mount Tungurahua in Ecuador said that people living around the mountain back to the area where they were having earlier evacuated due to the threat of volcanic hazards in 1999. The community action related to their livelihood was related to tourism, although such action is contrary to the directives of the government. Moreover, people is bound with their homeland (Kelman and Mather, 2008) and due to fertile land affected by volcanic eruptions. Tobin and Whiteford (2002) and Lane et al. (2003) conducted research on Tungurahua Mount, Ecuador state that people live around Tungurahua Mount come back again to their house even though they have been evacuated due to volcanic hazardous in 1999. This action is related to their livelihood based tourism even if against government regulation.

This phenomenon get along with previous study done by second authorthat the people relocation in Mt. Merapi seems difficult since there is a conflict between people safety and socio-economic interests (Sagala et al., 2009). As explained earlier, people living in Mt. Merapi are faced with socio-economic problems when they are forced to relocate. Previous example was when some of the residents in Turgo Hamlet, Pakem Sub-District that had to relocate down to another hamlet located down 10 km away from the volcano top. The relocation did not work well since most of them returned back to Turgo.

The tourism services in Volcano Tourism are categorized into ojek, food stall and souvenir shops, motor trail tour and jeep tour. Each of this is managed by an association. Each association has schedule and contribution from each member to the association. It has its own rule. Apart from association, there are some groups, such as parking and ticketing staff that receive monthly salary. Other services in Merapi Volcano Tourism are tourism village, lodging, camping ground, etc.

Formal, informal leaders and the follower’s interaction have become the sources of capacity in the tourism management. While considered limited in it’s achievement, this process is worth for studying and potential replication in other area. This paper examines to what extent the role of each actor in their interaction and networking in organizing and managing Merapi Volcano-based tourism development.

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2Motorcycletaxi
2. Literature Review

2.1. Sustainable Tourism

Apart from economic reason, (Dove, 2008) also suggests that there is a strong attachment between the community and the existence of Mt. Merapi. Therefore, the potential of increasing the economic benefit of Mt. Merapi will be important for the people, at least for two reasons. First, it provides an alternative source of livelihoods which subsequently increase community resilience. Second, the use of the area as volcano tourism will decrease the density and the built up area of the hazard zone which ultimately will make people exposure to the volcano decreases as well.

People put their own lives in danger solely of tourism. Thus, tourism should be well managed in order to thrive (Eagles et al., 2002). Furthermore, in average Merapi Volcano Tour’s visitors are in their first time come to Merapi(Harjito et al., 2011, Dwiputra, 2012) and curious about Merapi’s condition after eruption (Wijayanti and Sagala, 2012, Dwiputra, 2012). Since the curiosity of catastrophic damages as main tourist motivation to visit Merapi has been fulfilled, this will reduce attractive and interesting scenery of Merapi. Moreover, visiting rate will be declining dramatically. There should be a wise consideration for Merapi Volcano Tourism Management to prevent bigger impact from this indication. Development of volcano tourism needs support from several stakeholders in order to develop a comprehensive and sustainable tourism planning. This will include strategy, effective allocation and management of resources in the tourism area (Newsome, 2010). Stakeholder involvement is a critical part of sustainable tourism development. Collaboration among key players is a fundamental part in sustainable development efforts (Sautter and Leisen, 1999).

2.2. Network Theory

Identification of various actors’ contribution in the tourism Merapi is one way to create a sustainable tourism. One of the challenges of dark volcano tourism is getting more green the Merapi area would make tourists’ interest will decrease dramatically and soon will be vanish. So that, issue and problem should be discuss between actors and stakeholders in Merapi tourism area. First, we have to define who is actors really are. Actors can be analysed by using the stakeholder analysis. There are several definitions of the actors (stakeholders). According to (Clarkson (1995)), there are two definitions of stakeholders, primary and secondary stakeholders. The primary stakeholders are the people / parties where participation is required of an organization where no participation, these organizations cannot run. Secondary stakeholders are the person / party who are affected and affect the organization, but the role / participation does not affect the organization.

Basedon Sautter and Leisen (1999), tourism stakeholders consist of the following list below:
2.3. Factors on Interaction between Actors

There are many characteristics of interaction between actors. Those characteristics indicator are actors’ position, role, interaction each other, information sharing, and collaborative activities (Soerjono 2003), Taschereau and Bolger (2006), Coppola (2006), Varda et al. (2009), Chang et al. (2010), Vallance (2011).

Interaction between actors give comprehensive explanation about relation formed between two sides or more, both at individual level or community one (Soerjono, 2003). Interaction between actor happened because of common interest so that utilization of Social Network Analysis (SNA) can be important as SNA could describe impact that caused by the measurement interaction (Situngkir, 2012).

Volcano Tour Management establishment is good breakthrough. Eagles et al. (2002) mentioned that organization development in a tourism area can provide support labour to act together. This one can improve work quality, team cooperation development, and produce loyal, and commitment worker. Workers community existence in Merapi Volcano Tourism area is proven to generate tourism activity in Umbulharjo village onwards rather than Kepuharjo and Glagaharjo.

3. Method

3.1. Research Method

The research utilized applied qualitative research methods such as interviews with actors and key informants. The data collected from interview are analyzed using Ucinett16.0 Software and NetDraw to illustrate the visualization interaction between actors in tourism. This research started by identifying who is an actor in Merapi Volcano Tourism.
This research applies quantitative and qualitative analysis to identify interaction between actors and their role in Merapi Volcano Tourism. Qualitative survey was conducted through interviews to some selected key-informants. Interviews were carried out to the tourists and tourism service workers. Previous surveys were carried out in July 2011 and April 2012. This was followed in the next year by a week survey in June 2013. Each interview normally took around 1-2 hours. In order to obtain the objective information, triangulation was made through several key informants. All the interviews were recorded and subsequently transcript and made into coding sheets. The coding sheets were grouped and analyzed with qualitative content analysis in order to support the key findings. As an analytical approach, weighting activity has been done to establish between actors relationship matrix. Relationship matrix will then be processed with the help of NetDraw and UCINET6.0 software so as to obtain an understanding towards network visualization as well as actors’ characteristics and network from the actor interaction which was interpreted by way of statistical measurement. The drawing of conclusion in this study is being reflected on the drawing of qualitative conclusions. It is done by the interpretation result and SNA visualization with the obtained qualitative understanding.

We conducted interviews to the workers in the volcano tourism. They are selected as respondents through purposive sampling and snow-balling techniques through previous contact information that led us to another key-informant. The total numbers of key-informants are 38 people (see Table 2). They consisted of restaurant owner, souvenir seller, motor trail driver, jeep drivers, ojek driver, parking service and entrance ticket officer. Apart from these informants, we managed to interview the volcano tourism management that was managed by local village association. Other key informants are nongovernmental organization, each village and hamlet officer, and village tourism officer also are interviewed.

<table>
<thead>
<tr>
<th>Informant</th>
<th>Number</th>
<th>Information</th>
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<tbody>
<tr>
<td>Workers in Volcano Tour in Umbulharjo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restaurant owner</td>
<td>5</td>
<td>Disaster impact, livelihood before and after the disaster, reasons of livelihood change, interaction each other.</td>
</tr>
<tr>
<td>Souvenir Seller</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Motor trail driver</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Jeep drivers</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Ojek driver</td>
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<td>Merapi Volcano Tourism Management</td>
<td>1</td>
<td>Interaction between actor in Merapi volcano tourism</td>
</tr>
<tr>
<td>Sleman Tourism Agency</td>
<td>1</td>
<td>Functions and duties of Agency</td>
</tr>
<tr>
<td>Village and Umbulharjo</td>
<td>2</td>
<td>Functions and duties</td>
</tr>
</tbody>
</table>
Interaction between stakeholders in Merapi Volcano Tour as shown in the picture below:

**Figure 2. Interaction between stakeholders in Merapi Volcano Tour**
3.2. Research Location

This study takes place in two villages in Merapi slope, Umbulharjo and Kepuharjo. These two villages are known for volcano based tourism before Merapi eruption in 2006 and 2010. The eruption gave big impact to the tourism facilities that are prepared by local government. A huge investment by local association that supported by Sleman Tourism Agency in Umbulharjo and Kepuharjo were perished in second. Consequently, volcano-based tourism in Umbulharjo and Kepuharjo are not priority to Sleman Tourism Agency due to their location in prone area.

![Study Location Map in Cangkringan, Sleman District, Yogyakarta](image)

**Figure 3. Study Location Map in Cangkringan, Sleman District, Yogyakarta**

*Source: Adapted from the Centre of Volcanology and Geological Hazard Mitigation, Indonesia (2010) in Wimbardana (2013)*

4. Findings and Result

The finding shows that local tourism management organization and head of each association are major actors even though the formed of interaction is not optimal yet. This paper recommends involvement of other actors, such tourism department and local government to be involved in the Volcano-based tourism management. This partnership between involved actors will better provide sustainable tourism.
Figure 4. (a) Tourist in near Mbah Maridjan’s Tomb; (b) Alternate service in Volcano Tour by Motor Trail; (c) and (d) Sleman Tourism Agency’s Facilities in Volcano Tour.

*Source: Field Observation, 2012 & 2013*
Figure 5. Volcano Tour Establishment in Umbulharjo Village

Source: Modified from (Sagala et al., 2012)

Characteristics’ assessment of network interaction between various actors had been carried out by network visualization which was shaped throughout NetDraw software that represents actors’ position in the network. Volcano Tour Management and Head of each community are the actors with the most number of interaction relationships among other actors. Moreover, Volcano Tour Management and Head of each community hold an important role in Merapi Volcano Tourism.
Based on the assessment perform to each actor, a set of data is composed to show linkages between actors. Sociomatrix can be formed through this set of data. Results of sociomatrix can be seen in Table 2, and were exported into UCINET software to do the calculations.

**Table 2. Degree of Centrality Value of Network between Actors’ Interactions in Merapi Volcano Tourism**

<table>
<thead>
<tr>
<th>No</th>
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<th>InDegree</th>
<th>NrmOutDeg</th>
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<td>3</td>
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<td>21.000</td>
<td>27.778</td>
<td>23.333</td>
</tr>
<tr>
<td>4</td>
<td>Workers</td>
<td>24.000</td>
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<td>26.667</td>
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<td></td>
<td>Network Centralization (Outdegree)</td>
<td>42.680%</td>
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<td></td>
<td>Network Centralization (Indegree)</td>
<td>27.778%</td>
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Even if the degree of centrality is low (42.680%), Volcano Tour Management (VTM) continues to be a main actor who has the greatest degree of centrality among 21 other actors, both size of in-degree (interest) and out-degree (influence). Thus, the 21 other actors can be reflected as recipient of the influence of the main actor simultaneously. VTM bridges between field activities (workers and service
providers) with the government. VTM is also main part of Merapi volcano tourism initiator. Its goal is to support local communities to survive after Merapi eruption. In the beginning, VTM is intervened most of the volcano tourism activity. As the time goes by, management of volcano tourism handed over to each community. VTM is only spokesman to the government.

Furthermore, the government seems does not plan to develop the area since it is categorized as KRB III. KRB III is strictly prohibited to be built physically. Moreover, government’s support to Volcano Tour only limited to permission and recommendation within six months and should be updated in a periodical time. They realize Merapi eruption can happen in no time. So, there isn’t a long-plan. A long-term of Merapi Volcano Tour Management plan is not excessive, be able to serve tourist is more than enough. Their hope provides temporarily livelihoods for the community. At the same time, community livelihoods as a cattleman are recovered. From this point, Merapi tourism cannot be considered sustainable one. Development of Merapi volcano tourism is only from several stakeholders and each other stakeholder has its own interest.

5. Conclusions

The finding shows that local tourism management organization and head of each association are major actors even though the formed of interaction is not optimal yet. This paper recommends involvement of other actors, such tourism department and local government to be involved in the Volcano-based tourism management. This partnership between involved actors will better provide sustainable tourism.

The community self-help programme is affected by the existence of social capital because the idea of establishing this tourism area came from the local community. Local community’s participation is also essential in the management and maintenance of the volcano tour dark tourism area. The social capital within the community consists of leadership, social network, and community participation. Strong leadership that is exist in Volcano Tour Dark Tourism so that interaction between actors is centralized on their each community leader. All of them are some potential that can be used in order to provide better and sustainable tourism.

6. Acknowledgment

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ASSESSING COMMUNITY’S SOCIO-ECONOMIC ENHANCEMENT IN POST DISASTER RECOVERY: CASE STUDY OF MOUNT MERAPI

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Abstract
Post disaster recovery often focuses on physical recovery while neglects the socio-economic enhancement in community. It is partly due to physical recovery is more tangible and largely affect the community in the short term. However, recovery activities may become unsustainable if the social impacts have not been fully restored. Learning from case of post disaster recovery in Mt. Merapi, the present study investigates community’s socio-economic enhancement after the 2010 Mt. Merapi eruption. This paper applied qualitative survey by in-depth interview to vulnerable groups that may have been affected by the eruption and actors that have been involved in the recovery process, such as Non Governmental Organization (NGOs), and local governments. We also observed socio-economic situation in the Mt. Merapi community after the disaster and looked for recovery assistance from the agencies. Many members of community have lost their main livelihood on agriculture and livestock. In light of this disaster, however, this study found that the community has capacity to cope with the socio-economic impact and domesticate natural resource in the volcanic environment for their livelihood. For example, they established and managed volcano tourism that attracts many tourists to visit the site of the physical destruction in Umbulharjo Village. This study found that the existing of social capital in the community largely affect the enhancement process and result. Nonetheless, there is still missing connection between the community self-help recovery and the government recovery that remains a challenge for community resilience. This study recommends that active collaboration and mediation between local government and community leader would result to enhancement on achieving sustainability.

Keywords: community, Mt. Merapi; recovery; socio-economic

1. Introduction
Many people survive the initial disaster, but then suffer after it. The impact is not only physical impact, but also they could face the economy stagnates, social networks weaken, and health care and support services decline (Olshansky and Chang, 2009). Considering the social impact that may follow after the disaster, they should cope and

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deal with it to redevelop their normal life and to maintain their long-term sustainability (Smith and Wenger, 2007; Tobin, 1999). However, post disaster recovery often focuses on physical recovery while neglects the social enhancement in community. It is partly due to the physical recovery is more tangible and largely affect the community in the short-term (Lindell and Prater, 2003). Physical impact can be recovered in the short-term time, but social impact can create and aggravate social inequality for long-term period (Gordon, 2004; Olshansky and Chang, 2009). On the other words, community may become unsustainable if the social impacts have not been fully restored.

The 2010 eruption of Mt. Merapi (Indonesia) is known as ‘100’ year’s event which brought devastating disaster for the community who lives around its flanks. In that time, it generated tephra plume that reached 12 km altitude, released SO$_2$ emissions much larger than recorded during previous eruptions (from 1992 to 2007), resulted more than 280 lahar events along 13 rivers, and produced pyroclastic density flow currents that cruised 8 km down the Kali Gendol River and Kali Kuning River drainages channel on the south flank of the volcano (Surono et al., 2012). As result, 367 people were killed, 400,000 people were evacuated, and 2,300 houses were collapsed. The volcanic hazards also ruined infrastructures (such as dams, bridges, roads, etc).

The 2010 eruption also ruined local community’s economic assets, such as farmland, farming infrastructure, water storage, and livestock. Bappenas and BNPB (2011) estimated that the economic sector was the most suffered sector caused by the 2010 Eruption of Mt. Merapi. The economic damage and losses assessment entailed agriculture, fisheries, small-medium enterprise, and tourism. The damages and losses assessment calculated that the economic impact reached approximately 169 million US$ or 46.4% of overall damages and losses calculation. These kinds of physical destruction of economic assets could be followed by community welfare problem, such as job losses and poverty (Skoufias, 2003).
Some recovery strategies must be done to restore socio-economic condition after disaster. These were very important to encourage community to meet their basic need and to back on its feet as before or even better (Tobin, 1999). Therefore, they can maintain their sustainability in short term and long term period. However, to accomplish need greater understanding of present socio-economic impact and how to community recover from it. Taking case of post disaster recovery in Mt. Merapi, the present study is aimed to investigate community’s socio-economic enhancement after the 2010 eruption. A better understanding of current disasters social impacts and its recovery can contribute the development of recovery plans to prevent long-term consequences from occurring (Lindell and Prater, 2003; Olshansky et al., 2006; Tobin, 1999).

To achieve the whole representation of socio-economic enhancement by the community in Mt. Merapi, this paper outlined some theoretical background that focused in social impact and social recovery. The third part of this paper gives information of study location. Then, the fourth part of this paper discusses our findings in Mt. Merapi community. The article concludes the findings and some policy recommendations for governments and non-governmental actors.

2. Social Recovery in Post Disaster Situation: Literature Review

This following section discusses socio-economic recovery according to existing literature. First, we discuss about social impact of disaster concept. Second, how community recovers socially will be reviewed.
2.1 Social Impact

The root of changed condition after disaster is a result of risk constructed by the combination of natural hazards and vulnerability in the pre-impact time. Disaster will occur when there is an interaction between those factors. Wisner et al. (2004) stated that there will not be a disaster if there are hazards, but there is no existing vulnerability in the society attribute and their physical environment, or there will not be a disaster if there is a vulnerable society, but there are no hazard exposures that may occur in their environment. They also argued that a disaster occurs when a number of vulnerable people experience a hazard and suffer severe damage and/or disruption of their life and they cannot cope with the risk or the impact.

This concept can be described in terms of models proposed by Wisner et al. (2004), Lindell and Prater (2003), and Cutter and Enrich (2006). In the models, hazard exposure, physical vulnerability, and social vulnerability create unsafe condition in both nature and society. Vulnerability is a set of characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (Wisner et al., 2004). It is a combination of susceptibility factors embedded in people physical and social attribute, including livelihood, property, and other assets. Disaster risk will increase when hazard exposure exists. It arises when both physical and social vulnerabilities lie where it could be threatened by the probability of hazardous materials releases from the hazard source. Therefore, when the catastrophic event occurs, both the physical and social susceptibility lead them to damage and losses severity and they are less able to cope from risk or disaster impact (Cutter and Enrich, 2006).

![Figure 2. Disaster Impact Model](image)

Source: Adapted from Cutter et al. (2003), Cutter et al. (2008), and Lindell and Prater (2003)

We adapted from the disaster impact model developed by Cutter et al. (2003), Cutter et al. (2008), and Lindell and Prater (2003) (Figure 2). As shown in the figure above, the physical impact of disaster is the primary forms of devastation – causalities and damage – by natural hazard. The physical impacts of disasters include casualties (healthy, deaths, and injuries) and structural damage (infrastructure, public facilities, properties, etc). On the other side, social impacts are divided into psychosocial, demographic, socio-economic, and political impacts. Despite of the difficulties of measuring the social
impacts, it is nonetheless important to monitor them because they can cause significant problems for the long-term functioning of specific types of households and businesses in an affected community (Lindell and Prater, 2003).

After a disaster occurs, there are some group of people that may feel health and mental degradation. This impact is called as psychosocial impact includes fatigue, gastrointestinal upset, confusion, impaired concentration, attention deficits, anxiety, depression, and grief (Lindell and Prater, 2003). They also include behavioral effects such as sleep and appetite changes, ritualistic behavior, and substance abuse. These include children, frail elderly, and people with pre-existing mental illness, racial and ethnic minorities, and families of those who have died in the disaster. Six years after devastating tsunami in 2004, Acehnese survivors still had felt traumatic feeling of losses and disaster event and it became major circumstances to face the substantial changes caused by the devastating disaster (Irmansyah et al., 2010).

The major demographic impact of disasters is the social problem that may follow because of the destruction of dwellings (Lindell and Prater, 2003). They have to face many problems when they build back their house, such living in inadequate temporary shelters, logistic and aid distribution problem, living in temporary house with non-preferred location and structures, social cohesion depletion. Steinberg (2007) portrayed the community structure and cohesion in Acehnese people had been set apart by the mega tsunami in 2004, as many local community leaders died and many communities were separated into barracks and tents. As a result, it was hard to gather them in community meeting. There are also an increase number of emigrations of population segments that have lost housing (Cutter et al., 2003). In some cases, displaced people leave their neighborhood for temporary reason, such traumatic feeling, loss of job or community assistance, and conflict. For instance, approximately 30% of the population of New Orleans had not yet returned for three year since Katrina, and permanent repairs had just begun after they came back (Olshansky and Chang, 2009).

From household perspective, the main socio-economic impacts of disasters are direct economic losses in damaged properties or assets that used to be community’s main incomes (Ding et al., 2011; Lindell and Prater, 2003). Some of these cannot be replaced, so their loss causes a reduction in consumption (a decrease in the quality of life) or a reduction in investment (a decrease in economic productivity). Other assets can be replaced through either donations (e.g., food and clothing) or commercial purchases. There are also indirect of economic losses, especially the flow of resources between social units within a community. It can be defined that the resources, especially money, must be paid for products, services, economic inputs, and infrastructure support. The victims commonly have insufficient financial for buying service and materials aftermath. Number of unemployment also increases when many business close or move after disaster, so low-income workers are difficult to get new job (Lindell and Prater, 2003; Morrow, 1999; Olshansky and Chang, 2009).
In many cases, post disaster situation often leads dynamic social activism that bring political disruption after the disaster event (Lindell and Prater, 2003). Many cases of political impact is related to social relationship conflict between people at different level, such relation within household, between men and women, between different ethnic groups, between children and adults, and between citizens and their government (Wisner et al., 2004). An inequities external assistance distribution and decreasing quality of life drive to conflict between social units and also the agency. For an example, there was disproportionate distribution of the external assistance distribution in Pangalengan Sub-District (West Java) after the 2009 earthquake. Due to the belief of some leaders, some residents who did not the same belief were forbidden to receive relief distribution and it led to social conflict between the neighborhoods (Wimbardana and Sagala, 2012).

2.2 Social Recovery

From the previous section, we recognized that disasters leave physical environment destruction, social disruption, and economic stagnation which have critical impact to human lives. To avoid greater human, physical, and financial loss in the future, policy makers and practitioners are challenged to recover from those major impacts. Recovering from a disaster is a complex process and involves communication and coordination with many different agencies and individuals (Johnston et al., 2012). Despite of challenges in the recovery process, the recovery phase offers important development opportunity to restore, rebuild, and reshape the affected area that it could reduce future vulnerabilities and affect sustainable development outcomes (Berke et al., 1993; Olshansky and Chang, 2009; Smith and Wenger, 2007).

Appropriate recovery approach could provide a monumental window of opportunity to rebuild community stronger than before the event, reshape the existing social and economic system, and enhance disaster resilience. Many strategies can be done, such as the repair and improvement of damaged buildings and infrastructure, stimulating local economic, enhancing public capacity and awaraness to of hazard, etc. The failure approach can lead to new or greater vulnerability, such as poor reconstruction quality, a loss of jobs, a reduction in affordable housing stock, missed opportunities to incorporate mitigation into the rebuilding process, and an inability to assist the neediest recover (Smith and Wenger, 2007).

To implement the strategies, the recovery is influenced by the ability of an individual, family, group, class or community to use resources and access the resources (Wisner et al., 2004). The source can be acquired from community recovery resources and extra-community assistance. Community recovery resources can come from a variety individuals and Community Based Organizations (CBO). The victim might have financial asset (e.g. savings and insurance) and tangible asset (e.g. property) that undamaged by hazard impact. Lindell and Prater (2003) said that there are also another way to bring additional resource through overtime employment and freeing up the
needed finds by reducing their consumption. Friends, relatives, neighbors and CBO can contribute financial resource and help the victim with in-kind contribution. Extra-community assistance can come from NGOs, regional governments, national government, and foreign government. They can provide financial resource and financial assistance that do not need repaid by the victim or loans that might be offered at below market interest rates.

Morrow (1999) categorized four resources that could be used for recovery, including economic resources, personal resources, family and social resources, and political resource. In the term of disaster recovery, people earn a livelihood with differential access to material, social and political resources to get back to "normal life" after disaster. Access to such resources is always based on social and economic relations, including the social relations of production, gender, ethnicity, status and age, meaning that rights and obligations are not distributed equally among all people (Wisner et al., 2004).

Household possess different personal resources: health, physical ability, personal experience, education, time, and skills (Morrow, 1999). Health and mental illness can gain psychiatric diagnosis and most benefit more from a crisis or trauma counseling. The personal experience, education and skills possessed by household can significantly influence the recovery, such as better preparedness and appropriate behavior for future disaster response, gaining access to resources, better employment opportunities, dealing with bureaucracies and many more. For example, many victims of the 2004 Indian Ocean Tsunami were trained special skills, such as small and medium scale entrepreneurship, fishing, planting, etc., by many agencies in order to enhance the household economic recovery (Thorburn, 2009).

Economic resource can be recovers with financial assistance through grants for buying service and materials in aftermaths. Some of the specific mechanisms for financing recovery include obtaining tax deductions or deferrals, unemployment benefits, loans (paying back the principal at low- or no-interest), grants (requiring no return of principal), insurance payoffs, additional employment, depleting cash financial assets (e.g., savings accounts), selling tangible assets, or migrating to an area with available housing, employment, or less risk (in some cases this is done by the principal wage earner only) (Lindell et al., 2006).

Family and social resources are related to social capital (Morrow, 1999). Lack of social capital can be a limiting factor to seek recovery assistance. Nakagawa and Shaw (2004) defined that social capital refers to the trust, social norms, and networks which affect social and economic activities. Recently, scholars have sought to link the speed and effectiveness of the process of recovery to levels of trust and social capital. Aldrich (2010) and Nakagawa and Shaw (2004) that the resources is available to individuals through their social networks. Social capital can serve as informal mechanisms allowing victims to support networks for the sharing of knowledge, the sharing of financial need, the sharing of market information, the sharing of logistic and physical assistance, and
claims for reciprocity in times of crisis (Adger, 2003; Aldrich, 2010). Furthermore, social capital may drive into community collective action for recovery, although capable agencies are also required.

The disaster recovery period is the source of victim dissatisfaction and this creates many opportunities for community conflict. This conflict could be resolved to apply political right and access to decision makers (Morrow, 1999). In many cases, recovery of this political impact is facilitated when neutral recovery organizations hire local mediator to provide a link between these conflicted communities (Berke et al., 1993).

3. Method

This research was conducted using qualitative analysis in order to understand the process of impacted community doing the resilient strategy after the eruption happened. Qualitative analysis is also important because this research method not only allows to study about the community, but also study from the community (Fife, 2005). There are two approaches to conduct this research, which are macro and micro approach. The macro approach was done through desk study and thus the secondary data was derived. The secondary data consists of papers, government’s document and policy, information from newspaper and any other mass media. This approach delivers information about the whole post disaster recovery situation and the process in Mt. Merapi community. The micro approach was done through the direct observation and interview in the location study. This approach was applied to explore actual cases of socio-economic impact and enhancement after the physical destruction of community’s assets and properties. Both macro and micro approach’s data are accumulated from surveys conducted in April 2012 and July 2013.

This research was conducted in Umbulharjo Village, Kepuharjo Village, and Glagaharjo Village Cangkringan Sub-District, Sleman District. These villages were affected heavily by the recent 2010 volcanic eruptions. Many of villagers from both village live at relocation camps built in the their original village or even in different village which is far from their previous village. During the fieldwork, we visited six relocation camps in seven different villages: Karangkendal and Plosokerep (Former Umbulharjo Villager), Batur and Pagerjurang (Former Kepuharjo Village), and Kuwang and Dongkelsari (Glagaharjo Village). The fieldwork is also conducted in Volcano Tour area in Umbulharjo Village. All of those are located in north part of Yogyakarta City, the capital of Yogyakarta Province.
Purposive sampling and snowball was done to obtain the informants. The interviews were semi-structured, open-ended, and directly related to main information which gave the interviewees more freedom to narrate their experience with flow. Interviewed community members (n = 35) were classified to vulnerable groups who could be affected in socio-economic aspects by the 2010 eruption. They are vulnerable because their livelihood is depended on natural resources provided by volcanic environment (Kelman and Mather, 2008). They are cattlemen (n = 7) and tourism workers as follows: restaurant owner (n = 5), jeep drivers (n = 3), motor trail driver (n = 5), ojek² driver (n = 3), parking servant (n = 3), souvenir sellers (n = 5) and ticketing officer (n = 4). The interviews were also carried out to local government agency, including Village Government, Planning and Development Agency, Tourism Agency, and Agricultural Agency, and NGOs. They were carried in order to know the role of each organization in helping the community to have the resilience.

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² Ojek is an unlicensed motorcycle taxi carrying one passenger and sometimes two passengers.
The interview result are recorded by tape recorder and systematically arranged in transcript then. Because of the broad nature of the qualitative data, a sorting process followed, with segments of each interview placed in various content categories. We did a triangulation of different data resources, because it may also enhance the quality and reliability of the data. The qualitative data analysis focused on the content of participant statements. The final goal is to combine information patterns into wider and more objective analysis patterns.

4. Result

According to the previous literature and research findings in Mt. Merapi, we considered that the community in Mt. Merapi rely their well-being to natural resources provided by the volcanic environment, such as raising cattle, cropping, rock and sand-mining, and tourism activity (Dove, 2008; Sagala, 2009). Normally, the sand and rock mining activities are available along the river valleys which channelled the lahars from Mt. Merapi eruptions in the past time. The agriculture activities get benefit from the mild climate on the upper slopes of the mountain. The tourism activities include renting the rooms in the weekend, providing sightseeing of the mountain. However, the 2010 eruption brought massive destruction including those livelihood resources. This part will be focused on our findings about what is the socio-economic impact and how can they bounce back from the impact.

4.1 Socio-Economic Impact

Agriculture sector experienced a decreasing total of farmland area after the disaster. A million cubic volcanic materials of eruption ravaged approximately 1,865 ha of productive farming fields which half of the destruction is located in Sleman District (Wahyunto et al., 2012). Traditionally, this region is well-known as subsistence tropical agriculture area producing of rice in lower slope and cash crops in upper slope, such as tobacco, corn, maize, chili peppers, tomatoes, watermelons, taro, carrots, bananas, cabbages and peanuts (Wilson et al., 2007). Yet, the volcanic eruption harmed and buried the farmland. Bappenas and BNPB (2011) calculated that total damage in cultivation sub-sector was US$ 5.95 million and total losses of productivity was US$ 27.7 million.
While there has not been any report that record the trend of agriculture production after the 2010 eruption, the farming productivity around Mt. Merapi is predicted to be declining for short term period after the eruption occurred. Based on our interview with InFront, a local NGO who specializes in farming and forestry, there will be a period which several farming production will either decline or be stagnant because some type of plants were damaged by volcanic ash. Uyung, the Chairman of InFront argued:

“After the eruption, we could find many snake fruit plants were damaged by the volcanic ash. Consequently, the damaged snake fruit plants that had been in mature stage were failed to be harvested. However, based on our research, the plants are still productive, but it will take two years to recover from the damage and to return their productivity as before.”

Nonetheless, plants recovery is very dependent on its type. Wilson et al. (2007) observed after Mt. Merapi eruption in 2006 that root and low-growing vegetables, such as carrots, potatoes, onions and cabbages, were resilient to ash fall or the level of damage was low. These vegetables tend to be shielded by taller plants (such as chilli peppers, tomatoes, tobacco or peanuts) which provided a tephra-shadow effect. Tobacco is very vulnerable because its large and hairy leave trapped the ash. It needed four weeks to recover by sprouting new leaves.

The volcanic materials also swept away community’s livestock in the 2010 eruption. Mostly, the community represent their livelihood through animal husbandry (e.g. cattle, oxen, sheep, goats, chickens, and ducks) to produce and to sell its meat, egg, and milk (Dove, 2008; Wilson et al., 2007). The upper slope of Sleman District is well-known as the regional center of milk production in Yogyakarta. In 2009, there were 5,265 dairy
cattle producing an average daily milk production of as much as 15.1 tons (The Government of Sleman District, 2013). During the eruption 2010, the lahar and pyroclastic flow killed approximately 21% of cattle population, in Sleman District (Priyanti and Ilham, 2011). Poor evacuation management, plenty of cattle to be evacuated, uncertain day-care cost and limited capacity at evacuation camp led the livestock to be abandoned in community village, and only few of cattle could be saved to evacuation camp (Mei et al., 2013; Priyanti and Ilham, 2011).

In addition, survived livestock had to face following health, feed, and productivity problem after the disaster event (Mei et al., 2013; Sani and Estuningish, 2011). Many of survived cattle had burnt scar, weight loss, diarrhea, and respiration problem caused by volcanic ash. They are fed in poor stall by with ash-covered grass, inappropriate fodder nutrition (such as cassava, banana tree leaf, and jackfruit) and limited fresh water storage. Therefore, this condition caused to declining milk production. For instance, before the 2010 eruption, milk community cooperation in Arbinangun Village (Pakem District) had 2,800 cattle which could produce 5,500 liter/day. Right after the eruption event, they were lost about 964 cattle and they could produce only 350 liter/day. Farmers who were not able to feed up their cattle preferred to sell it when the price was at low prices\(^3\) (300 to 500 US$) during the eruption period (Mei et al., 2013). Animal husbandry damage and losses in Sleman District was estimated around 9.6 million US$ (Bappenas and BNPB, 2011).

The physical damage and losses of economic assets have affected indirectly to local people livelihood. Based on our interview with former cattlemen, they had to lose their previous jobs and main income since their livestock are dead or sold right after the end of emergency period. According to Umbulharjo Village’s demography data (Cangkiringan Sub-District) in 2008 and 2011, cattlemen number in Umbulharjo Village decreased from 2,520 people in 2008 to 327 people in 2011. They had several reasons why they stopped keeping and raising cattle. First, they did not have enough money to buy, keep, and raise cattle while they had to rebuild their dwelling. Second, some proper feed nutrition (e.g. fresh water resource and no ash-covered grass) was limited in Mt. Merapi’s environment and the price was expensive in markets. Third, they lived at shelter camp where there was no adequate stall to keep and raise cattle. As a result, there were not only cattlemen who were lost their main livelihood because of their cattle death during the eruption, but also those who still had cattle after the eruption also experienced the same situation.

The buried farmland in Putih River riverbank, southwest flank of Mt. Merapi, also affected local people livelihood in this region (Pamungkas, 2012). Approximately, 73% of land use in this area was farmland cultivated by around 80% household from 10 villages. Since the lahar event inundated their farmland, they tend to did nothing for short term period because they could not plant anything and the agriculture commodities

\(^{3}\) The regular price for female cow in Yogyakarta and Central Java region was around 700 to 1000 US$ before the 2010 eruption.
were damaged. They needed more than two years to excavate sand and rock from their farmland and to start planting.

4.2 Socio-Economic Recovery

Certainly, the people in Mt. Merapi need to recover their livelihood downturn and economic crisis after the devastating disaster. They also need to have steady income to meet their basic daily needs. To achieve these, they have done some strategy to recover from the socio-economic impact using their own resources and/or community assistance by various agency. In this part, recovery strategy and community’s socio-economic enhancement will be discussed according to our observation and interview with local community members during the fieldwork and recent literature sources.

4.2.1 Coping with Socio-Economic Impact in the Early Recovery Phase

Right after the end of emergency phase, the government of Indonesia helped the victims by “buying” their dead livestock, especially cattle. Based on our interview with local agricultural agency in Sleman District, this policy was aimed to enhance household economic recovery after the devastating disaster. The compensation price of cattle was based on cattle’s milk productivity: 850 US$ for a cow, 550 US$ for a heifer and 350 US$ for a calf. Instead of using the cash for restoring their livelihood resources, the beneficiary tend to use it as saving to meet basic need during living in emergency shelter, such as food, clothes, children’s education needs, and rebuilding their dwelling.

“I used to raise some cattle, but they were killed by the hot cloud. Then, the government indemnified them with some money” Tourism worker 1 – Former Cattleman

“As poor people, I used the cattle compensation for my family basic need, paying my children’s education cost, and rebuilding my house.” Cattleman 2

Farmers in Putih riverbank area had different challenge to cope with the physical destruction of their farmland. Since they did not receive any compensation for their buried farmland and loss of productivity because of harvest failure, they had to recover their farmland by excavating sand, rock, and clean ash by their own initiative (Pamungkas, 2012). Cooperating with sand mining business which emerged after the eruption, they sold the sand and the rock to them and they also got their farmland back. Then, since the irrigation was harmed by lahar and no major reconstruction had been finished, they cultivated it with seasonal plants which can grow in dry environment, such as chili, beans, and vegetables.
Based on our interview, the community who live in Kepuharjo Village, south flank of Mt. Merapi, also did this strategy too. They excavated their buried house in their previous village to sell the materials to sand mining company. The money was used to help them to recover their economic condition. After the excavation process will have been done, they do not intend to settle in there because the land is in the forbidden area of Mt. Merapi. To make it productive, they plan to plant cash crop and domesticate the product for domestic consumption.

On the other side, there were a few of people who could access resource from their own saving and family/relatives. Other financial resources were come from cooperation loan and in-kind donation. So, they used the compensation for restoring the livelihood resources. However, they had to start their work from nil. For example, they had to start raising calf which was not mature enough to produce milk.

“Until now [July 2013], my children always send me money to fulfill my daily needs. They also helped me to buy some land to build a new house where I live now. So, my compensation money was used to buy two calves and house materials.” Cattleman 6

“I withdrew my saving for buying some calves, but they have not produced any milk yet [April 2012]” Cattleman 3

“I lent a calf from milk cooperation in Kepuharjo Village. The agreement allows me to raise cooperation’s calf until it becomes a cow and bears a calf. Then, I have to give it to the cooperation.” Cattleman 7

However, there were community members who did not use the financial assistance to restore their previous livelihood. There were many difficulties and challenges to undertake animal husbandry and planting (see 4.1 section). So, many of them tried to change their livelihood. For instance, the establishment of tourism area in Umbulharjo Village in December 2010 attracted them as a new opportunity to get income (see 4.2.2 section). They used the compensation to purchase capitals that support them while working in there.
“I received the compensation from the government. I used the money for purchasing a motorcycle, so I could provide ojek service in here (Volcano Tour area). So, I can earn some money from it, and then I am able to buy a motor trail.” Motor Trail Driver 1

Figure 7. A Cattleman and His Cow in Kepuharjo Village
Source: Field Observation, 2013

4.2.2 The Establishment of Volcano Tour and Its Role to Community Recovery

Apparently, there was a blessing in disguise behind the disaster. The 2010 eruption of Mt. Merapi not only conferred massive destruction to the environment, but the demolished environment became a new tourism attraction. They came to the area because they were curious to see what natural phenomena had done in destroying people’s life.

However, at first, the demolished area was unmanaged. The local community created illegal ticket to enter the tourism area in December 2010. Apparently, such activity made the visitors felt not comfortable, therefore the head of Umbulharjo Village, hamlet leaders, and some of local figures initiated to manage the tourism area. As argued by Sagala (2009), the community in Mt. Merapi tends to take action because of hamlet leader’s instruction. In March 2011, they established a tourism management by an agreement between them and they also opened the tourism area with official name: the Volcano Tour (Figure 8).

“In that time (December 2010), visitors reached 6000 – 7000/day, but the tourism area was out of managed, such as no rule for safety standard, environment protection, and community assets protection. Each visitor have different purposes to visit there, for instance taking photo, watching the demolished houses, or even stealing community properties. So, we (the head of Umbulharjo Village, hamlet leaders, and some of local figures) initiated to form a management and a set of rules that manage the tourism area. However, we worked without government’s support” Badiman, The Head of the Volcano Tour Management
The Volcano Tour provides three objects that can attract both local and foreign tourists. These objects are as follows: first, the grave of Marijan, the late gate keeper of Mt. Merapi who died in the eruption of 2010; second, objects or built environment that destroyed by the eruption; and third, volcano tour drive to the large scale devastated area by the volcano eruption. The local people provided motor trails and jeeps for single and group passengers. Apart from these attraction objects, the mountain scenery and the temporary facilities provided by the local people added to the comfort of visiting the volcano tourism.

To take benefit from the Volcano Tour existence for local people, the tourism management applies some strategies. First, it manages the money obtained from the ticket and to decide how the money is distributed among the people and public purpose. Second, the management encourages participation from the villagers of Pelemsari and Pangukrejo, two hamlets in Umbulharjo Village where the tourism area is located, to take role as tourism servant. The management has a rule that those who are allowed to work in the tourism area are the people who lived in Kinahrejo and Pangukrejo before the eruption. This is because the tourism area is located in those hamlets. In this case, the social network is growing because the people came from the same location and those who did not come from Kinahrejo or Pangukrejo Village are not allowed to work in the tourism area.

Obviously, the existence of the new tourism has been successfully helping the community to rise from adversity. They could work for tourism services: ojek driver group, motor trail driver group, jeep driver group, souvenir seller group, food seller group, and field officer group. This opportunity then attracted them and started new jobs in the tourism area. As the Volcano Tour had created the new job opportunity for people, it also helped people to earn money. Although some tourism workers admit that their income gained from tourism activity was less and more stable than as a cattleman or planter, but it is sufficient enough to help people fulfilling their
daily needs. In addition, the profit gained from the entrance ticket selling is also used for the independent house reconstruction (Figure 9). Therefore, the tourism activity in the Volcano Tour area is a kind of community self-help recovery programme and it has helped people to bounce back from disaster.

“In the past, my cows could produce milk that provides sufficient income for a month. Now, our income is depended on tourist’s visit. There are some times that the number of visitors is not as many as holiday time.” Ojek Driver 1

“Now, I work as both cattleman and ojek driver. However, my cattle are still calves. So, they have not produced any milk yet. I work for ojek driver as alternative job to enhance my income. Yet, I am trying to back as cattleman again” Ojek Driver 2

Figure 9. Ticket Revenue Share
Source: the Volcano Tour Management, 2012

5. Conclusions
This paper reveals that the eruption 2010 of Mt. Merapi not only affected physical destruction to local community’s economic assets, but also they could not avoid the following socio-economic problem. Both plantation farming and animal husbandry are the most suffered sub-sector since the volcanic materials mostly struck, swept away, and damaged the community’s agriculture resources, such farmland, farming infrastructure, water storage, and livestock. Therefore, many people had to survive in the condition which they had to face economic stagnate because of the potential declining agriculture production, loss of job, and decreasing household income. Many difficulties hampered local inhabitants to restore their economic condition, for instance 1) insufficient of natural resources around Mt. Merapi environment that it support their livelihood (e.g. water resource and livestock), 2) the increasing price of livestock’s fed, 3) the decreasing of livestock’s health and productivity, and 4) inadequate infrastructure to support livelihood restoration.

In light of the devastating disaster, however, this study found that the community has capacity and find strategy to cope with the socio-economic impact. They domesticate both natural resource in the volcanic environment and financial assistance to re-establish their livelihood. The
existence of volcanic materials in their buried land and properties are exploited to help them to earn money and get their assets re-productive as before. The financial assistance (e.g. government compensation and in-kind donation) could help community’s economic situation to meet their basic needs situation or started working. While some of local people used it for short term period when living in shelter camp, there were also people who has sufficient financial resources invested it for either restoring their previous livelihood or preparing for new/alternative livelihood.

This paper has examined the potential how a volcano hazard prone offers benefit through volcano tourism to the communities living on the slope of the volcano. The huge impact of the volcano eruption has become a strong attraction for people and become a source of income for local community that works in the tourist area. The Volcano Tour not only had created the new/alternative job opportunity for local people, but it also helped people to earn money. While the income obtained from the tourism activities is still less than the income they received from working as before, the existence of the new tourism has been successfully helping the community to rise from adversity.

The community recovery process in Mt. Merapi is largely affected of the existence of leadership, social network and community participation. For example, the role of the leaders is important in organizing the local people as well as managing the programmes which one of it is the Volcano Tour area as the fund source of recovery. The social network also helped to collect financial resources. The community participation is shown by the willingness of people to work together in the preparation and management of the tourism area. These factors are important because it can be a good foundation to create community resilience for the future disasters.

Nonetheless, there is still missing connection between the community self-help recovery and the government recovery that remains a challenge for community resilience. This study recommends that active collaboration and mediation between local government and community leader would result to enhancement on achieving sustainability. This achievement will be important in increasing the community resilience by contributing not only to hazard related factors but also to socio-economic factors that contribute to decreasing the vulnerability of the society.

Acknowledgement
This paper is part of publication produced from a research project entitled “The Model of Local Community’s Socio-Economic Recovery After Volcanic Eruption. Case Study: Volcanic Disaster Prone Area in Mt. Merapi” under research project funded by Directorate of Higher Education, Ministry of Education Indonesia. In addition, we thank other research team who also helped in data collection as follows: Anastasia Ratna, Roby Dwiputra, Febriyanti, Adrian Mangunsong, Dian Lutfiana and Dodon.

References


**Web page source:**
COASTAL FLOODING ADAPTATION BY HOUSING ADJUSTMENT IN COASTAL SETTLEMENTS
Case Studies: Muara Angke, North Jakarta and Tambak Lorok, Semarang

Juarni ANITA¹ & Hamzah LATIEF²

Abstract
There is a phenomenon of rising the floor elevation of houses in coastal settlements in Muara Angke, North Jakarta and Tambak Lorok, North Semarang to avoid coastal flooding, which are frequently inundated the settlements there. The coastal flooding hazards existed due to the sea level rise and extreme rainfall as influenced by climate change and exacerbated by land subsidence and poor drainage have become a threat to those areas. Muara Angke and Tambak Lorok as fishermen settlements are located at the coastal area bordering to the Java Sea. To overcome the problem, communities in these settlements have been done adaptation by rising the floor elevation to improve and adjust the housing quality to meet the household’s needs. This effort is called housing adjustment.

This research attempts to explore the coastal flooding maps in Muara Angke and Tambak Lorok and housing adjustment which done by communities, especially rising floor elevation of the houses. This research was conducted with quantitative and qualitative research methods. The quantitative method was used to plan the flooding map and analyzed the rising floor of the houses, and the other qualitative was used to describe the house condition. The results of this research are to define the coastal flooding scenarios at those areas in the future and the classification of housing adjustment in coastal settlements to adaptation the coastal flooding.

Keywords: adaptation, coastal flood, floor elevation, housing adjustment

1. Introduction

In the last two decades, the coastal flooding became a big problem in the northern coast of Java Island, especially for large cities such as Jakarta and Semarang. It occurs due to several factors, such as: tidal waves, global sea level rise, ENSO, storm surges, land subsidence, higher rainfall or water runoff from hinterland, and sediment deposition (siling) on the river bed and estuaries. Some of the factors such as: global sea level rise, storm surges, rainfall, etc., are directly related to climate changes. Those factors make the magnitude of inundation depth and inundation extent become higher and wider, while the occurrences become more frequently.

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The severity of flooding resulting from the runoff of rainfall water and coastal flooding from the sea in coastal areas of Jakarta as shown in Figure 1. This flood has been submerge infrastructure and settlement and exacerbating the building function as well as greatly affect to the environment and life qualities in the affected areas, such as health and sanitation conditions. Figure 2 shows the same thing for the Semarang city, which is only inundated by coastal flooding.

Figure 1. (a) Flooding from hinterland and (b) Coastal flooding in Jakarta

Figure 2. Coastal flooding and examples of subsidence impacts in Semarang on mid April 2009
(courtesy of Kompas photo, 2 July 2009 in Abidin et, al, 2010).

Impact of the coastal flooding insists the communities to adaptive the hazards by adjusting their houses through floor elevated, so that the floor elevation of the houses
are become not same, depend on their own capacity and budget to cope the coastal flooding. Since the Jakarta and the Semarang cities have suffered of the impact of coastal flooding, so that this research will be focused on those two cities with case study of Muara Angke in North Jakarta and Tambak Lorok in North Semarang, because those areas have a high density of population of fishermen settlement which have low capacity to adaptive the coastal flooding. Due to the impact of floods in these settlements, so that the communities have initiative to elevate the roads in front of their houses and elevated their houses to avoid the flood, so that they can stay at home during the flood.

This research will assess the coastal flooding map of Muara Angke and Tambak Lorok, and housing adjustment which done by communities. The aim of this study are to define the coastal flooding scenarios at Muara Angke (Jakarta) and Tambak Lorok (Semarang) in the future and the classification of housing adjustment in there as effort to increase adaptive capacity of the coastal flooding.

The coastal flooding map for Jakarta are generated from the sea level scenarios of tidal data, ENSO, storm surges and global sea level rise and then overlay with Digital Elevation Map (DEM) and satellite imagery from google earth, while coastal flooding map for Semarang are adopted from hydrodynamic simulation with scenario of tide, monsoon, and storm surges and overlay on the google earth map as given by Syahran (2013). Furthermore for settlement data were collected through field survey. This research also based on the data on what residents perceived, and why they raised their houses. Those data were collected through depth interview with 15 purposive respondents in Muara Angke and 8 purposive respondents in Tambak Lorok. Respondents were selected based on the criteria that they have lived more than 7 years and have been flooded several times (including the great flood in the year of 2007), and their houses have been renovated at least within the last 2 years. At the same time, literature study about coastal flooding, flood hazard mitigation, the relation between people and their environments, and housing adjustment was studied.

2. Muara Angke and Tambak Lorok Settlements

2.1. Muara Angke Settlement in North Jakarta

Muara Angke is a delta where surrounded by Asin River in the east, Adem River in the west, and Jakarta Bay in the north. It included in Pluit village and subdistrict Penjaringan, in North Jakarta. Fishing port of Muara Angke was built in July 7, 1977. This region was prepared to accommodate the fisheries that spread over several locations in Jakarta. Muara Angke has been designated as a center for fisheries development in Jakarta since 1990. Initially, this region had an area of 62ha, but the Jakarta Government developed the region with reclamation in 2006, so that this area became ±71.7ha at present (see Figure3). This region consists of fishermen housing (21,2 ha), fish landing bases (5 ha), mangrove forests (8 ha), fish processing (5 ha), ship docking (1,4 ha), vacant land (6,7ha), market (1 ha), terminal (2,6 ha), soccer field (1 ha), and ferry ports to Pulau Seribu (2 ha). Fishermen housing was planned to be inhabited by owners of
fishing boats, crews, fishing workers, salted fish laborers, and fish traders (UPT PPKP and PPI Muara Angke, 2011).

![Diagram of Muara Angke Settlement as Case Study](image)

**Figure 3. Muara Angke Settlement as Case Study**
(Source: UPT PPKP and PPI Muara Angke and field survey, 2013)

### 2.2. Tambak Lorok Settlement in North Semarang

Tambak Lorok consists of Tambak Mulyo and Tambak Rejo, located near to the Tanjung Mas Port and Banger River. It included in Tanjung Mas village and subdistrict North Semarang. In early 1950 decade, several people started to inhabitant those location and working as fishermen. The land at near the coast were developed as fish shrimp, and craps ponds. Firstly the land was owned by Indonesian Ports Authority or Pelabuhan Indonesia (Pelindo) and reclaimed the Tambak Lorok by means to build a container port in 1987. However a planning to build the container port could not realize because the fishermen settlement have been developing very fast after the reclamation. Since the year of 2000, the land have been owned by the government of Semarang City. Currently the Tambak Lorok become the largest producer of fishes in Semarang. The location of Tambak Lorok can be seen in Figure 4.
3. Coastal Flooding

3.1. Sea Level Rise and Land Subsidence

Sea level rise that caused by the climate change or global warming could inundate lowland and swampy areas, resulting in shoreline retreats and increases of beach erosion, damages of coastal ecosystems, and even submerges of small islands. Global warming due to greenhouse gases causes thermal expansion of the ocean especially in the surface layers (steric effect) and the melting of glaciers and ice caps and ice sheets at the poles, resulting in increases of ocean volume and raises of the ocean surfaces. IPCC Report (2007) mentioned that in the period of 1961-2003 the global sea level rose 1.8 mm (range of 1.3-3.0 mm) per year, while the increase rate is higher between 1993 until 2003, that is about 3.1 mm (2.4-3.8 mm) per year. Long-term variability of the rate of sea level rise is obvious. The results of IPCC AR4 research stated that thermal expansion is contributed about 70% of the global sea level rise and roughly 30% of ice melting. Reduce of ice covered areas will increase the absorption of short-wave sunlight by land and ocean as well as the reduction of reflection by the ice surface. This condition will increase the acceleration of global warming, ice surface melting, thermal expansion rising, and eventually impact on the global sea level rise. In reality sea level may suffer both long-term and short-term changes (Latief and Fitriyanto, 2009):

- Long term change of sea level is also called as secular change. It is categorized into two classes according to its causes: (1) Eustatic changes or changes of sea water volume, and (2) Local changes that includes land uplift or subsidence or is called as isostasy effect. This isostasy effects comprises thermal isostasy due to changes in temperature or density of the Earth interior, glacioisostasy related to the presence of ice, hydro-isostasy associated with the presence of water, volcanicisostasy due to magma extrusion, and sediment isostasy linked to deposition and erosion. Sediment compaction could cause land to be compressed,
or subsidence of oil and ground water extraction. While eustatic effects is a change of ocean basin due to expansion of the ocean floor, changes of oceanic ground floor elevation, and sea bed sedimentation.

- Short term sea level changes could occur due to several forces including ocean tides, storm tide, and storm surge (cyclone). A rise in sea surface height will occur when the storm surge coincides with highest tide level, known as storm tide. These phenomena have periods between daily up to weekly. El Nino and La Nina phenomena also affect sea level in a short time period. At the time of the El Nino occurrence, sea surface in Indonesian waters decreases, while during the opposite La Nina the sea level increases. Besides, flooding in certain seasons is also a seasonal variation that may affect sea level in the short term, which increases runoff from rivers into the sea causes additional sea level rise. These changes occur in seasonal up to annual periods. In addition the sea surface oscillations occurring at harbors known as a seiche is also a factor that affects sea level in short-term. These changes could occur within a period of minutes to hours. The land subsidence due to ground water extraction and loading of the high rise building could cause relative changes in sea level to the land. In addition to above phenomena, global warming also affects air temperature rise automatically and cause changes in atmospheric pressure and other climatic variables such as wind and rainfall. These phenomena will trigger a series of natural hazards which potentially give stressor and would impact to the coastal zones like in Jakarta and Semarang.

Serious attention to the coastal flooding impacts in Jakarta and Semarang needs to be paid early. Although the changes are slow (gradual) but the potential impact of the coastal flooding would be very likely and extends to the entire the coastal area. On the other hand, both the people who live or who have activity in coastal zones have suffered and disturbed their daily activities.

Sea level rise in the northern coast of Java average was 1.45cm/year during the years of 2005 to 2011 (Hadi, et al., 2012). Contribution of La Nina is about 15 cm and the storm surge is about 30 cm. The major factor that contribute for relative sea level rise in Jakarta and Semarang city is land subsidence. The land subsidence is mostly due to the unstable soil compaction, and the effects of human activities such as excessive ground water extraction and loading of high-rise buildings.

Land subsidence in Jakarta has a magnitude which varies between 0.036 to 0.06m in Koja area; 0.012 to 0.036m in Cilincing area; 0.036 to 0.048m in Panjaringan area, and 0012-0036 m in Kalideres. A greater land subsidence was found in Pulogadung, Senen, Gambir, Grogol, Petamburan, Tambora, Taman Sari, and Pademangan areas which ranged between 0.048 to 0.06 m as shown in Figure 5 (http://meandmycoastallife.Blogspot.jp/2010/12/coastal-problem.html). While the subsidence in Semarang, based on the Environmental Geology Center survey results of from 1999 to 2003, found that are relatively large subsidence was detected round Semarang Port, Hasanuddin cottage, Bandar Harjo and Tawang railway station, with the subsidence rate around 1to 17 cm/year (Murdohardono et al., 2007 in Abidin et,
al 2010). The Global Positioning System (GPS) derived contours and zones of subsidence rates in Semarang as shown in Figure 6 (Abidin et al., 2010). This phenomenon is clearly happening in the Jakarta city and Semarang city.

![Figure 5. Map subsidence in Jakarta](http://meandmycoastallife.blogspot.j/2010/12/coastal-problem.html)

![Figure 6. GPS derived contours and zones of subsidence rates in Semarang](source: Abidin, et.al, 2010)

3.2. Coastal Flooding in Muara Angke

Coastal flooding occurred several times in Muara Angke, the last floods occurred in 1999, 2002, 2007, 2012, and 2013. Flooding occurred due to several factors such as spring tide, heavy rainfall, land subsidence, river silting, garbage piled up, and the dike collapse. To cope the coastal flooding in Muara Angke, the City Government of Jakarta (DKI Jakarta) which represented by Technical Unit of Muara Angke (UPT Muara Angke) have developed a protection strategy of settlements as a polder system (structural approach) to avoid flood. It consists of levees, two reservoirs, and two pumping stations; each station has four pumps, as shown in Figure 3 above.

In the aim to assess the extreme coastal inundation in Muara Angke, so we developed two extreme scenario for year of 2013 and coastal inundation projection in the year of 2030, by considering ocean tides with the highest high water level (HHWL) is 53.6 cm and La Nina is about 15 cm and storm surges is about 30 cm above mean sea level (MSL) base on the ocean parameter are given by Hadi (2012). Inundation map of extreme scenario of 2013 are shown in Figure 7. While the projection coastal inundation in 2030 is developed by adding the global sea level rise with magnitude about 39 cm. We assume that condition of tide the projection of inundation map for 2030 is shown in Figure 8. The DEM are used in these maps are already considered the land subsidence. Need to note that some of the land surface elevation existing under the mean sea level. The land became dry because the existing of flood protection along the coast and the river. However in the spring tide some of the area became flooded.
3.3. Coastal Flooding in Tambak Lorok

Coastal flooding due to the ocean tides began occurred since in the year of 2002 in Tambak Mulyo Area and 2005 in Tambak Rejo. Although tidal flooding frequently occurred over the year, however the coastal protection system has not been built yet in Tambak Lorok. There are no reservoir and pump to help protect the settlements from flooding. This settlement was rumored to be relocated several times (1975, 1992, 2000, and 2010) for expansion of the Tanjung Mas Port. Perhaps because of
the rumor, the flood protection system has not been built in this settlement. Similarly, there are no community health center facilities, public schools, and clean water from government. Meanwhile the existing the Fish Landing Port (TPI) is an important facility for the sustainability of fishing activities in this area.

Inundation map for Tambak Lorok is adopted from Syahrani (2013). She simulated the coastal inundation in Semarang by using hydrodynamic model with considering the ocean tides, wind monsoon and storm surges. The simulation consist of 3 (three) scenarios namely: scenario-1 only considered ocean tides, scenario-2 considered ocean tides and wind monsoon, and scenario-3 considered ocean tides, wind monsoon and storm surges. The inundation map of North Semarang is shown in Figure 9. From the simulation, she found the inundation depth and inundation distance in Tambak Lorok is listed in Table 1. Figure 9 shows that the Tambak Lorok always inundated during the flood tide over the year. Then the impact of coastal has been disrupting daily life. It can be seen from the inundation extent of the coastal flooding is likely to be wider.

### Table 1. Inundation depth and distance in Tambak Lorok

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Ocean Parameters</th>
<th>Inundation depth (m)</th>
<th>Inundation distance (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ocean tide</td>
<td>0.28</td>
<td>2.04</td>
</tr>
<tr>
<td>2</td>
<td>Ocean tide and wind monsoon</td>
<td>0.34</td>
<td>2.05</td>
</tr>
<tr>
<td>3</td>
<td>Ocean tide, wind monsoon and storm surges</td>
<td>0.3446</td>
<td>2.14</td>
</tr>
</tbody>
</table>

Figure 9. Inundation Map in Tambak Lorok during in 2013
*(source: Modified from Syahrani, 2013)*
4. Housing Adjustment as Effort to Increase Adaptive Capacity of Coastal Flooding

Relationship between people and environment can be explained by the stimulus-response theory. Stimulus is an object or event that is apprehended by the senses such as changes in the human environment, while the response is a behavior that occurs in humans as a result of the stimulus he/she receives (Iskandar, 2012). Environmental stimulus will be assessed in one's cognition (cognitive appraisal), whether the stimulus is dangerous or not. Flood events in neighborhoods can lead to stress in humans because of the arrival of the sudden flooding, damaging home and furniture in it, and even threatening the safety of the occupants.

People will strive to maintain the standard they have, trying to cope with the pressure or threats in the surrounding environment, so that they can change the environment to adjust with their wishes, in order to maintain comfort (Bell, 1990 in Iskandar, 2012). People are always trying to manipulate the environment to suit their circumstances.

Regard to adaptation, the main determinant of the motivation to adapt-what an actor wants to do, indicated by motives like goals, values or norms-is the relative risk perception. The judgment that a flood in the area would harm valued things, such as home or property, would relate to the perceived severity. Perceived severity is the person’s appraisal of how harmful the consequences of the threat would be to things he or she values if the threat were to actually occur. Adaptation appraisal when a person evaluates his or her ability to avert being harmed by the threat, along with the costs of taking such action. Result of the adaptation appraisal process is a specific perceived adaptive capacity. The objective ability or capacity of actors (what an individual, a group, or a culture could do, indicated by the availability and the access to resources) only partly determines if an adaptive response is taken (Grothmann and Patt, 2005). Therefore, responses to the extreme events such as flood, private actors (like homeowners) renovate their houses can be called as effort to increase the adaptive capacity.

Adjustment measures can be carried out by governments, communities, and individuals in the family to cope with environmental stresses. Government builds levees to protect the settlements, builds reservoirs to collect rainwater and waste water from residential areas, using pumps to remove water into the sea, and elevate the streets (Desmawan, 2010; Gultom, 2012). These adjustment measures are taken by the government so that people can still live even the area is flooding prone area. Adjustment measures can also be done by the homeowners. If they feel there is a gap between the actual condition of the house and a decent house in his opinion, they feel dissatisfied being at home and will renovate their houses, which is called housing adjustment (Crull, et. al, 1991). The homeowners action by elevating the house, extending and adding functionalities in the house can be called housing adjustment.
4.1. Housing Adjustment in Muara Angke Settlement

In Muara Angke settlement, initially built fishermen settlement is Block H and Block L, where the phenomenon of housing adjustment can be found, therefore this area was chosen as study location (see Figure 3). Furthermore, these blocks will be retained as landed housing, while the surrounding slums will be planned to be converted into flat housings. Totally there were approximately 360 houses, after several years, some houses were merged, two houses into one owner, so that the remaining houses are approximately 319 houses. According to the respondents, they do housing adjustment by rising the floor to avoid flooding and can do daily activities more better than before. The number of houses with raising floor elevation which is above the road level are amounted to as many as 90.5% (289 houses), meanwhile the number of houses which are under the road are amounted to as many as 9.5% (30 houses) because the occupants do not have enough money to raise their houses.

The classification of housing adjustment can be seen in Table 2 as follows:

<table>
<thead>
<tr>
<th>Classification of Housing Adjustment</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| 1. Low house                        | • The floor has been elevated several times, but the roof has not been elevated, therefore the house looks like drowning.  
• Several of houses have floor elevation under the road level.  
• Generally the respondents have not enough money and knowledge to adjust their houses, so that they feel uncomfortable in their houses. They have low adaptive capacity.  
• This type is approximately 8% in settlement |
<table>
<thead>
<tr>
<th>Classification of Housing Adjustment</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| 2. Single storey house with elevated floor | • The floor has been elevated above the road level, and the roof has been elevated too, but the house still as single storey house.  
• The floor elevation is various about 10 -100 cm above the road level.  
• Several houses have converted to be economic function such as retail, saloon, food stall, etc.  
• The homeowners feel difficult to do daily activities while flooding occurs.  
• This type is approximately 39.4% in settlement |
| 3. Two storey houses with elevated floor | • The floor has been elevated approximately 40-130cm above the road level, and roof has been elevated, becomes two storey houses.  
• Several houses have extended economic function such as retail, rented room at the second floor, etc.  
• Several houses using wood material for second floor because the cost is cheaper and easy to dismantle when they rise their houses in the future.  
• several houses which ceiling heights are about 3.5– 4.5m. They believe that floor will be elevated in next five years.  
• They could do activities at the first floor (elevation > 80 cm) and the second floor while flooding occurs.  
• This type is approximately 52.6% in settlement |

Purposive respondents who selected by the criteria that they have lived more than 7 years and have experienced flooding several times. The size of their houses that was originally 40m² had been increased to 100-170 m². All the rooms had been expanded (living, family, dining and kitchen). Houses which originally had 2 bedrooms were modified to 3 to 10 bed rooms. From 15 respondents, there are 8 houses using wood material for second floor because the cost is cheaper and easy to dismantle when they rise their houses in the future. There are 12 houses which ceiling heights are approximately 3.5– 4.5m because the respondents are confident that they will raise the floor again in the future. Building coverage ratio that was initially 53% had been increased to 100%, so that the houses have no garden nor open yard. Therefore, most
of the houses tend to be lack of day lighting and fresh air. They use air conditioning and fan to reduce temperature in the house.

4.2. Housing Adjustment in Tambak Lorok Settlement

Tambak Lorok settlement includes Tambak Mulyo and Tambak Rejo areas. It is difficult to count the number of houses in this settlement because several houses had set and these houses were empty, there may be about 2000 more houses in 5 (five) neighborhoods (RW 12, 13, 14, 15, and 16). This fishermen settlement is different with Muara Angke. Originally the people built their houses by themselves, therefore the size of their houses is different from one another. The classification of housing adjustment can be seen in Table 3 as follows.

Table 3. Classification of Housing adjustment in Tambak Lorok

<table>
<thead>
<tr>
<th>Classification of Housing Adjustment</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| 1. Low house                         | - The floor has been elevated several times, but the roof has not been elevated, therefore the house looks like drowning. The ceiling height is approximately < 2.5 m, there is even a ceiling height 1.2 m.  
- Several of houses have floor elevation under the road level. Several of them are empty.  
- Generally the respondents have not enough money and knowledge to adjust their houses, so that they feel uncomfortable in their houses. They have low adaptive capacity. |
<table>
<thead>
<tr>
<th>Classification of Housing Adjustment</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| 2. Single storey house with elevated floor | - The floor has been elevated above the road level, the roof has been elevated, too, but the house still as single storey house.  
- The floor elevation is various about 20-140 cm above the road level.  
- Several houses have extended economic function such as retail in Tambak Mulyo Street (main road in this settlement).  
- The homeowners feel difficult to do daily activities when flooding was happening, especially the floor elevation < 80 cm. |
| 3. Two storey houses with elevated floor | - The floor has been elevated about 40-140 cm above the road level, and roof has been elevated, as two storey houses.  
- Mostly these houses have extended economic function such as retail and rented room by woman workers.  
- Several houses using wood material for second floor because the cost is cheaper and easy to dismantle when they rise their houses in the future.  
- Several houses which ceiling heights are about 3.2–4.5m. They believe that floor will be elevated in next five years.  
- They could do activities at the first floor (elevation > 80 cm) and second floor when flooding was happening.  
- This type is approximately 1% in settlement |

Single storey houses with elevated floor are more commonly found in this settlements. The size of houses is approximately 50-200 m². All the houses have an empty space between the houses (they called ‘lengkong’), the width is about 50 cm in both sides (left and right sides) of the houses. Some of the houses have windows and ventilation at ‘lengkong’ side, they tend to have day lighting and fresh air. All the houses have not used air conditioning.

5. Conclusion

Coastal flooding hazards analysis show that nowadays the Maura Angke is always inundated during spring tides with the inundation depth about 0-0.5 meter, the depth will be increased to be 0.7 m during La Nina and even more during storm tides. The projection of global sea level rise in the year of 2030, will be increased about 36 cm,
so that the inundation depth will become 0.5-1.0 meter in Muara Angke. As well as Tambak Lorok, Semarang, its always also inundated during spring tides with inundation depth around 0.28 m and will become 0.35 m during the storm tides. The relative inundation depth and distance will be higher and wider in the future due to the global sea level rise and land subsidence which is gradually changing.

In Muara Angke, the city government has done a measure by coastal protection, polder systems and reclamation, while in Tambak Lorok, the government has done reclamation, however it has not been protected from coastal flooding by coastal protection such as polder system. Therefore, the tidal flood is still common and more houses were submerged in Tambak Lorok compared Muara Angke. Income of residents of Muara Angke is higher than Tambak Lorok, therefore more housing adjustment into 2 floors in Muara Angke compared Tambak Lorok.

In Muara Angke and Tambak Lorok settlement, people do housing adjustment to avoid flood and can do daily activities while flood is happening. This housing adjustment perhaps has happened too in coastal settlements, in flood prone area. This adjustment as effort which be done by the homeowners to increase adaptive capacity. The similarities in the two settlements, the classification of housing adjustments include low house, single storey house with elevated floor, and two storey houses with elevated floor. Housing adjustment have been done by homeowners such as elevated ground floor (20 cm to over 100 cm), elevated the ceiling (3m to 4.5m), using wood floor for the second floor, and elevated terraces can be used for sitting and motor parking. The differences between Muara Angke and Tambak Lorok, almost of the houses in Muara angke use air conditioning to reduce temperature in the houses, meanwhile there are no air conditioning in the houses in Tambak Lorok because they have ‘lengkong’ beside the houses.

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BEYOND FLOOD CONTROL INFRASTRUCTURES: PROMOTING INTEGRATED FLOOD MANAGEMENT (IFM) THROUGH SPATIAL PLANNING BY USING SPATIAL MULTI-CRITERIA ANALYSIS (SMCA)
Case Study Of Marikina River Basin, Metropolitan Manila - Philippines

Mirwansyah PRAWIRANEGARA

Abstract
Marikina River Basin lies in Metropolitan Manila, which is the national capital of the Philippines. This paper tried to explore the lesson learned from the experience of extreme flooding incidence in Metro Manila and surrounding areas in September 2009, during the most devastating typhoon to hit the country named as Tropical Storm (TS) Ondoy. The flood frequency estimation for Ondoy Flood can be varying from several sources. Regardless which one is the most accurate, the massive loses and damages indicated that the existing flood control structures in Marikina River Basin was unprepared to cope with the extreme flood peak flow during Ondoy. It showed clearly that humankind would never be able to eliminate disaster risk completely even by employing the most sophisticated mitigation efforts through flood control structures such as levee, floodwall, hydrologic control system, floodgate and floodway. The Risk can only be managed by addressing its components comprehensively, which is by reducing Hazard, Exposure, and Vulnerability. Therefore, this paper proposed a more comprehensive and sustainable approaches in managing flood, namely: giving equal emphasis on non-structural measures through land use/ spatial planning, using river basin as spatial framework of management, managing risk rather than solely on hazard, and incorporating water quality concerns, employing multi-hazards approach, and integrating land and water management. Flood risk assessment, surface water and groundwater vulnerability assessment are the crucial starting point to implement those approaches, and GIS-assisted tool of analysis known as Spatial Multi-Criteria Analysis (SMCA) is the practical but powerful tool to conduct the assessments. This research developed and conducted the SMCA in Marikina River Basin, which eventually lead to areas identification or the common spatial focus between water quality and water quantity management and flood risk reduction concerns that need to be integrated into spatial planning to promote risk and water-sensitive spatial plan.

Keywords: Disaster Risk Reduction, Integrated Flood Management, Spatial Multi-Criteria Analysis, Flood Risk Assessment, Surface Water and Groundwater Vulnerability Assessment, Spatial Planning.

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1. Introduction


title="Extreme flooding incidence in Metro Manila"

According to World Water Development Report in 2006, during the decade of 1992-2001, about 90% of all natural disasters worldwide were water-related or hydrological in origin (UNESCO, 2006). In the developing countries of with tropical climate especially in Asia, addressing disaster risks from floods, landslides, droughts, pollution and storm surges are becoming more prominent challenges to prevent setback of development goals that have been pursued. These disaster risks appear likely to increase in the future due to the changing environmental context such as global climate change that added the uncertainty in mitigation efforts, and rapid unplanned urbanization that brought problems of uncontrolled land use changes, massive urban sprawling, poverty, urbanizing river basin and environmental degradation. Water-related hazards are becoming more frequent and intense, while urban expansion and population growth lead to the increasing exposure and vulnerabilities to the disaster hazards.

The Philippines is one of the most natural hazard prone countries in the world, especially for water-related disasters (floods and landslides) triggered by typhoon (World Bank, 2005). The most devastating typhoon to hit the country was Tropical Storm Ketsana (local name: Ondoy) in 25 to 26 September 2009, which affected 4,342,997 people nationwide and almost half of the casualties was in the nation’s capital (NDCC, 2009). According to the same situation report by NDCC, in Metro Manila (National Capital Region/NCR) alone, the damage and casualty data include; 871,882 persons affected, 207 dead, 395 injured persons, and 52,958 partially damaged houses. Cities in Metro Manila, which are located in the downstream of Marikina River such as Cities of Marikina, Quezon and Pasig, suffered the most. Those cities accounted for 48 % of total affected persons, 82 % of the dead (mostly drowned during the flood), and 41% of the injured and 99.6 % of partially damaged houses in Metro Manila. Therefore, Marikina River Basin indeed the priority areas to reduce disaster risk in the country, particularly in the metropolitan area.

Floodings is actually frequent incidences in Marikina River Basin. But during the Typhoon Ondoy, the rains generated record-magnitude flooding in the Pasig-Marikina River Basin (Liongson, 2010) where the water level of Marikina River reached 22.16 meters at Sto.Nino station-Marikina City. (World Bank study team, 2012) from a normal level of 12 meters and precaution stage when it is more than 13 meters. The degradation of the Marikina watershed or upper Marikina River Basin – located in Antipolo city, San Mateo, Rodriguez, Rizal Province - is being blamed as the main cause of such massive flooding (BussinessMirror, 2010; manila times, 2011; MWCI, AECOM, & PAMB, 2012). Consequently, management of river basin as a whole becomes crucial in reducing disaster risk of downstream urban areas in Metro Manila.

The Failure of Flood Control Infrastructures

TS ondoy passed in the night of September 25, 2009 and last for the entire day of September 26, 2009. The flood frequency estimation for Ondoy can be varying from several sources (Liongson, 2010; World Bank study team, 2012). These sources
mentioned the Ondoy flood as 500 years flood, average annual frequency of 1 in 100 years, and return period around 70 years. It actually depends on the available historical data being used, rainfall duration as reference (1-day or 2-day), and the location of rainfall measuring station, because there is spatial variation in the TS Ondoy rainfall distribution.

Existing flood control infrastructures system related to Pasig-Marikina River Basin can be categorized into three systems, namely: 1) Mangahan Floodway with Rosario Weir and one Control Office with Hydrological Stations, which function to divert excess flood water to the Laguna Lake with the design scale of 100 year, 2) Napindan Channel (improved by Floodwall) with Napindan Hydrological Control Stations, which function to extract reserved floodwater from the Laguna Lake to Pasig River, 3) Pasig River Channel (improved by parapet wall, dredging works, revetments, flood walls, river linear parks), which function to prevent overflow against 30-year scale flood.

Regardless which flood frequency estimation is the most accurate, the massive loses and damages indicated that the existing flood control structures in Marikina River Basin was unprepared to cope with the extreme flood peak flow during Ondoy. The flood impact showed clearly that humankind would never be able to eliminate disaster risk completely even by employing the most sophisticated mitigation efforts through flood control structures. The Risk can only be managed by addressing its components comprehensively, which is by reducing Hazard, Exposure, and Vulnerability, or in other words by using the perspective of Disaster Risk Reduction (DRR).

**Beyond flooding: water quality, groundwater quantity, and land use concerns**

Besides flooding, other water problems are also prominent in Marikina River Basin. In term of water quality, data from Laguna Lake Development Authority (LLDA) study in 2008 shows that the basin has been recipients of untreated domestic sewage and surface runoff. The water quality is decreasing overtime and decreasing over space, from upstream to downstream. Regarding groundwater quantity, data from National Water Resource Board (NWRB) of the Philippines, revealed the critical decline of ground water table from 1994 to 2004, especially in the lower part of the basin. As in many other countries, in the Philippines, water governance and regulation is highly sectorial where at least 30 government agencies and offices concerned with water resources development and management are responsible for their own sectorial concerns (NWRB, 2006).

Water resource concerns are multi-thematic, multi-sectorial, have high complexity and in most cases highly fragmented in the management, vertically and horizontally. There are many competing interest and uses of water resources and many institutions with different concerns at various levels of governance from national to local, which are involved in water resources management. While existence of large quantity of water within short time can lead to flood disaster, ensuring long-term availability at acceptable quality water supplies is also crucial for the urban population. Polluted surface water will also exacerbate the flood disaster impact by causing diseases for instance, while declining groundwater resulted in land subsidence could lead to
larger areas exposed to flooding. Groundwater is also known as potential source of water supplies because it is less vulnerable to pollution in comparison to surface water, thus less treatment is needed and less expensive. By looking at the water cycle as a whole, the interaction of groundwater and surface water in flood plains actually provides the benefit of flood in recharging groundwater. This interaction through infiltration and percolation also might cause polluted surface water contaminates groundwater, and once it happened remediation will be very difficult if it is not impossible. Water management is highly connected to land use planning and management, because how the land is being used and utilized, have implications to water flows and quality through run-off, pollution, erosion, sedimentation, and infiltration.

Water management is highly connected to land use planning and management, because how the land is being used and utilized, have implications to water flows and quality through run-off, pollution, erosion, sedimentation, and infiltration.

Water issues mentioned above, namely; the surface and groundwater interaction, the water quantity and water quality concerns, the many interests, involved institutions and uses of water resources, the upstream-downstream conflict or causes and effects of water related disasters such as riverine flooding and landslide, are more efficient to be managed on a whole-of-catchment basis or river basin, and these called for a more comprehensive and integrative way of management or known as Integrated Water Resources Management (IWRM) in general and Integrated Flood Management (IFM) in particular, including its integration into land use/spatial planning.

**Beyond Flood Control Structures: Integrated Flood Management (IFM), Disaster Risk Reduction (DRR), and Spatial Planning**

One of the backgrounds of IWRM is to handle vertical and horizontal fragmentation in water management. On this matter, flood risk reduction and management also faces the same fragmentation problem. That situation triggered the emergence of new concept at the international level to manage flood risk comprehensively, known as Integrated Flood Management (IFM). IFM is a process promoting an integrated approach to flood management by integrating land and water resources development in a river basin, within the context of IWRM, and aims at maximizing the net benefits from the use of floodplains and minimizing loss of life from flooding (WMO, et al., 2009).

IFM is a concept that also embraces risk management as principle, while the plan itself can be a Basin Flood Management Plans because IFM promotes river basin as a planning unit (WMO, GWP, & APFM, 2008). An IFM plan should address the following six key elements that follow logically for managing floods in the context of an IWRM approach (WMO, et al., 2009):

- Manage the water cycle as a whole: interaction of groundwater and surface water in flood plains and the benefit of flood in recharging groundwater.
- Integrate land and water management
- Manage risk and uncertainty: addressing residual risks through non-structural measures such as flood-sensitive spatial planning.
- Adopt a best mix of strategies: combination of structural and non-structural measures.
- Ensure a participatory approach
• Adopt integrated hazard management approaches: multi-hazard approach and the interconnection of multiple hazards

“Risk” is the probability of a loss, and can be viewed in the form of a triangle composed of three elements, namely; hazard, vulnerability and exposure (Crichton, 1999). Therefore, it can be argued that flood risk can be reduced by mitigating the hazard, preventing exposure and reducing vulnerability. Based on the Hyogo Framework for Action (HFA) 2005-2015, which was declared in Kobe-Japan 2005 and adopted by 168 countries, land-use planning and incorporation of disaster risk assessments into urban planning are keys and priorities in disaster risk reduction (UNISDR, 2005). According to United Nations International Strategy for Disaster Reduction (UNISDR), Risk Assessment is defined as a methodology to determine the nature and extent of risk by analyzing potential hazards (location, intensity, frequency and probability) and evaluating existing conditions of vulnerability (physical, social, economic) that could pose a potential threat or harm to people, property, livelihoods and the environment (UNISDR, 2004). Therefore, Risk Assessment is the fundamental starting point and is at the center of the focus for disaster risk reduction, it becomes the basis for determining risk reduction measures including land use/urban planning, and which appropriate measures to be included in the land use plan in addressing risk and its components (hazard, exposure, and vulnerability).

Spatial planning roles in flood risk management can be viewed in a narrow or broader way. A narrow one sees spatial planning as regulatory instrument to control land use change in flood prone areas (Hutter, 2007). While a broader view sees spatial planning as facilitation of participation and conflict resolution among different spatial claims (Neuvel & Knaap, 2010). In line with the broader view, Howe and White (2004) mentioned that inclusion of flood management measures in the land use plans would be beneficial because these measures become part of statutory plans and will attract public consultation. Spatial plans can also contribute in integrating urban design features that enable an increase in storage capacity of an area and to increase infiltration level, thus reducing run-off and peak flow (Howe & White, 2004).

“Making space for water or river” is an emerging policy and strategy of flood management in European countries, as exemplified in Netherland, UK and Belgium (Kelly & Garvin, 2007; Woltjer & Al, 2007). It symbolizes paradigm shift in flood management, from flood defense perspective to a more sustainable approach, from focusing on flood control by means of structural measures to drain water as fast as possible from certain areas, to higher emphasis on non-structural measures.

In most cases, the “space for water” as mentioned above is equal to flood plains or flood risk zones. Flood plain management provides linkage between spatial planning and flood protection. Thus, the incorporation of flood plain into land use and spatial planning through flood plain zoning is crucial. Floodplain zoning constitute an important tool to operationalize a risk-sensitive approach and it can be undertaken on the basis of floods of different average annual exceedance probabilities, and the most
commonly used for land-use planning purposes is the 1 percent or 100 year return period) (WMO, GWP, & APFM, 2007).

Due to different spatial planning system, not all countries have river basin land use planning to promote a more coordinated multiple-local land use plans within a river basin, especially under a highly decentralized planning system. In the context of the Philippines, land use planning is divided into national, regional, provincial, and municipality/city level. A formal land use plan at river basin/watershed level does not exist, and only at the municipality/city level, the land use plan has legal or administrative legitimacy that is when the Comprehensive Land Use Plan (CLUP) is enacted through Zoning Ordinance (ZO). So on one hand, integrating flood management or DRR down to the local level land use/spatial planning is definitely very important, because its legitimacy provides higher potential in achieving objectives compare to other plans. On the other hand, basin-based land use plan as a bridging component among riverine flood risk reduction, basin-wide water concerns, and multiple-local land use plans, is not part of the planning system.

**Research approach and objective**

This paper proposed a more comprehensive and sustainable approaches in managing flood, namely: giving equal emphasis on non-structural measures through land use/spatial planning, using river basin as spatial framework of management, managing risk rather than solely on hazard, and incorporating water quality concerns, employing multi-hazards approach, integrating land and water management. Flood risk assessment, surface water and groundwater vulnerability assessment are the crucial starting point to implement those approaches, and GIS-assisted tool of analysis known as Spatial Multi-Criteria Analysis (SMCA) is the practical but powerful tool to conduct the assessments and it is a spatially explicit method thus easier to be use in spatial planning. These approached also in line with the key elements of Integrated Flood Management (IFM).

The research objective is to develop and to conduct SMCA in Marikina River Basin, which eventually lead to areas identification or the common spatial focus between water quality and water quantity management and flood risk reduction concerns that need to be integrated into spatial planning to promote risk and water-sensitive spatial plan.

**Basin Delineation (Scope of Study Area)**

River basin/watershed delineation is a basis for defining spatial scope of study area and the unit of analysis, thus it is very crucial for the study. Using the unit of sub-watersheds will also allow better visualization and to see the linkages of several LGUs connected by the water flow. Its delineation will heavily depend on the accuracy and the map scale of topographic data as input and the method used whether manually or automated delineation by aided tool. The input data in this analysis is Topographic Map scale 1:50,000 produced by NAMRIA (National Mapping Agency) and the method used for watershed delineation in this study is comprehensive terrain processing using Arc Hydro tool which delineate watershed and sub-watersheds by deriving from Digital Elevation Model (DEM). The analysis mainly covers DEM Manipulation, terrain processing and watershed processing. It
includes spatial analysis tools such as flow directions, flow accumulation, stream segmentation and catchment delineation (ESRI, 2011). Besides Arc Hydro, this part of the analysis also used 3D Analyst and Spatial Analyst extensions in ArcGIS 9.3 desktop software package.

Based on the result of basin delineation analysis coupled with the administrative boundaries data, Marikina River Basin covers San Mateo, Antipolo City, Rodriguez in Rizal Province, and the Cities of Quezon, Marikina and Pasig in Metro Manila. With total of 53,893 hectares, it is composed of 8 sub watersheds with a total of 38 catchments. By using data at barangay/village level, the estimated population in 2007 is 2,150,512 people.

Figure 1. Watersheds in Marikina River Basin

2. Analysis

2.1. Spatial Multi-Criteria Analysis (SMCA)

The spatial integration between water-related DRR and water quality management can be promoted by integrating the common spatial focus into land use or spatial plan. The common spatial focus is the important spatial requirements in addressing water quality, water quantity, and basin-flood management concerns. By means of GIS assisted approach, the research includes the development of Spatial Multi-Criteria Analysis (SMCA) for flood risk assessment, vulnerability assessment of surface water to pollution, and vulnerability assessment of groundwater to contamination. SMCA is combination of Multi-Criteria Analysis (MCA) and Geographic Information System (GIS) (Meyer, Scheuer, & Haase, 2009). It can be viewed as a process that combines and transforms spatial and aspatial data (input) into resultant decision (output) through procedures (or decision rules) that define the relationship between the input maps and the output map (Malczewski, 2004).

The result of the assessment determines the most sensitive areas to be targeted and would need special treatment/regulation in the land use plan/zoning in order to maintain the water resources sustainability (quality and quantity, surface and ground
water) and to reduce the water-related disaster risk. In other words, these areas are the spatial requirements to promote Integrated Flood Management (IFM). Addressing this common spatial focus will contribute to integration improvement in the future.

Figure 2. Analytical Framework of Promoting Integrated Flood Management (IFM) through Spatial Planning By Using Spatial Multi-Criteria Analysis (SMCA)

2.2. SMCA for Flood and Landslide Risk Assessment

The existing flood risk map related to the study area was produced in the Flood Management Plan (World Bank study team, 2012). It is resulted using the criteria that are mainly derived from flood depth, which is the most crucial parameter of danger to casualty. By using the alternative definition of Risk by the UNISDR approach where RISK = HAZARD X VULNERABILITY, and Exposure is actually referring to the physical aspects of vulnerability, the existing flood risk map mentioned can be considered as flood hazard map. For example, if two areas located along Marikina River were inundated more than three meters during Ondoy flood, it can be said that they are sharing the same level of flood hazard. However, the risk or the expected loss of lives and assets they faced can be different, because both areas have different exposure level and socio-economic vulnerability. By incorporating the
Hazard, Exposure, and Vulnerability, the alternative flood risk map can be derived and it would be useful to visualize which risk areas that need to be prioritized in terms of DRR measures and need special treatment or arrangement in the land use plan or zoning regulation.

Many other studies in Disaster Risk Reduction also try to incorporate the component of hazard, exposure, and vulnerability in determining risk level (UNDP, 2004, Birkmann, et al., 2011, Kron, 2002). Most of those projects/studies used GIS to analyze those components. It can be observed that, while the component of risk can be agreed universally, there is no set of universal standard for its operationalization in the analysis or at the practical level. This study employs Spatial Multi-Criteria Decision Analysis (MCDA) by utilizing GIS to determine flood risk index in Marikina River Basin, which integrates the component of Hazard, Exposure and Vulnerability. It is a qualitative approach by assigning index to qualitative and quantitative measurements and uses ranking such as high, moderate and low to assess risk and its components. Each of those three components of risk has selected sub-indicators with specific variables to operationalize or to measure it and specific numerical index or score and afterward the aggregation are made by using sum-weighted overlay method. Each indicator and sub-indicator have index values ranging from 0 to 1 and weight ranging from 0 to 100% where higher the values represent higher risk level or higher contribution to risk. A simple equation and flowchart of the analytical framework provided below will give clearer visualization.

\[
\text{Risk Index} = H_r H_w + (E_1 E_{1w} + E_2 E_{2w}) E_w + (V_1 V_{1w} + V_2 V_{2w} + V_3 V_{3w} + V_4 V_{4w} + V_5 V_{5w}) V_w
\]  

Where:
- \( H \) = Hazard Indicators
- \( E \) = Exposure Indicators
- \( V \) = Vulnerability Indicators
- \( r \) = rating/index
- \( w \) = weight

**Multi-hazard Approach**

The flood in the study area is more of a riverine flood rather than local inundation. Consequently, it is also important to analyze the risk in a multi-hazard environment and in basin wide spatial scale. The other hazard beside flood is landslide, which affects the upstream of river basin. Landslide can instantly reduce the channel capacity of the river or causing debris flow, if the rain-induced landslide and riverine flood occur simultaneously. The multi-hazard approach is also crucial to prevent policy error such as reducing people exposure to flood hazard but afterward exposing them to landslide, e.g. relocation of informal settlers in the flood prone areas to certain places in the upstream, without proper consideration on landslide hazard. Furthermore, reducing the risk of landslide in the upstream can also be beneficial in reducing the flood risk in the downstream, through reduction of flood hazard intensity.
Steps in SMCA

There are several steps in conducting SMCA. At the first stage, analytical frameworks were developed for Basin-wide Flood and Landslide Risk Assessment that integrate Hazard, Exposure and Vulnerability components. Necessary steps were taken including defining indicators/variables for each of components of Risk and its geodatabase preparation, standardization of parameters, weight assignment for indicators, and sensitivity analysis. At later stage, analysis was applied in Arc GIS 9.3 software environment to conduct risk mapping. Identified Very High Flood Risk Areas were also validated by High-resolution Satellite Images. The landslide risk assessment also follows the same method, but with slight difference on the vulnerability indicators.

Defining indicators of Hazard

Using one of the universal definitions by UNISDR, hazard is a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Each hazard is characterized by its location, intensity, frequency and probability. Those characteristics are the principal guidance in identifying the suitable indicators & maps to represents flood hazard.

There are at least three flood hazard maps that can be considered as reliable sources and can be used as reference for spatial planning: 1) simulated flood depth map based on Ondoy flood parameter conducted by World Bank study team and Department Public Works and Highways (DPWH), 2) flooded area maps during Ondoy issued by local governments (LGUs of Marikina, San Mateo, Pasig, Rodriguez) based on field survey, and 3) flood susceptibility map by Mines and Geosciences Bureau (MGB).

The first version (World Bank & DPWH) has the features of location (spatial extent), intensity (the flood depth), frequency and probability (100-year return period) and it was derived from scientific hydrologic and hydraulic modeling. The second version (LGUs) has similar feature but they are derived from field survey, consequently the spatial extent of inundated area can be accurate but the flood depth information is questionable. There are discrepancies between these two versions especially on the spatial extent; where the inundated area according to the LGUs of San Mateo and Rodriguez Municipality are generally larger than the simulated flood depth map by World Bank & DPWH. The third version (MGB) was produced based on experience before Ondoy Flood and qualitative GIS overlay method using rating, but it covers most of the flooded areas during Ondoy according to LGUs map. Therefore, one of the logical approaches to build the flood hazard map is by combining the first and the third versions and assigned hazard levels.

Defining indicators of Exposure (Physical Vulnerability)

The risk or the probability of loss and damages from disaster are highly influenced by the element at risk itself or the degree of exposure. Exposure depends on whether people or assets are in range of flood inundation. Considering the availability of
relevant data, the exposure indicators in the study are composed of population density and building density.

The first indicator for exposure is population density. The smallest unit of available population data is at barangay (village) level while the river basin or watershed boundary does not coincide with the administrative boundaries such as city/municipality and barangay. Consequently, the proportionate population size needs to be estimated, by assuming that population is distributed equally across geographical space.

The second indicator of exposure is building density. The author acquired building footprint maps from several local governments (LGUs) located in the basin with varying data captured date and different coordinate system. Due to different sources and condition, spatial data cleaning was conducted by standardizing coordinate system of various maps, and filtering the overlapping coverage by selecting the recent map as higher priority. Afterward building density (unit/ha) is analyzed by using density function in Spatial Analyst of Arc GIS 9.3. The density function by using kernel density method was applied to produce a continuous surface.

Between the two sub-indicators for Exposure, Building Density is given higher weight compared to Population Density. This is in consideration that building density map has higher accuracy because it is derived from the building footprint maps based on satellite images or air photos, while population density is derived by using estimation along with its assumption.

**Defining Indicators of Socio-Economic Vulnerability**

Vulnerability is defined by UNISDR (2004) as the conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards. This study focuses on the physical vulnerability (exposure) and socio-economic dimensions of vulnerability. Data availability and accuracy, and spatial scales heavily influenced the selection of sub-indicators. The current available and most complete data at barangay (village) level is NSO population census 2007 data under Public Use File (PUF) which is a detailed electronic database built upon the result of the census. The users have to generate their own data/table from that electronic database by using CS pro 4.1 software.

Although an ideal complete list of variables to describe vulnerability could not be achieved, some statistical data from NSO-PUF were selected as variable or sub-indicators in the study. After generating the tabular data from NSO-PUF, the next step is geo-coding, or putting these tabular data on the map. The details of selected sub-indicators are provided below.
Table 1. The Selected Vulnerability Sub-indicators, Measurement and Rationale

<table>
<thead>
<tr>
<th>No</th>
<th>Vulnerability Sub-indicators</th>
<th>Concept/ Measurement</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dependent Population by Age</td>
<td>Percentage of Children (below 15) &amp; Elderly (Above 65) out of the total population</td>
<td>Children and elderly are physically frail and they may not be able to help themselves during disaster.</td>
</tr>
<tr>
<td>2</td>
<td>Low Education Level</td>
<td>Percentage of Population with Education below Elementary or no grade completed out of the total population</td>
<td>People with low education level is assumed to have less motivation and lower ability in finding and seeking or understanding information concerning disaster risk, and it is also a constraint in disaster awareness raising (IEC) program.</td>
</tr>
<tr>
<td>3</td>
<td>Low Income Level</td>
<td>Percentage of population that work as Laborers and unskilled workers out of the total productive age population</td>
<td>People who work as laborers and unskilled workers is assumed to have the lowest income level compared to other occupation category. The low-income level represents low coping capacity to disaster.</td>
</tr>
<tr>
<td>4</td>
<td>Dependency to locality/local safety</td>
<td>Percentage of population work in the same city/municipality out of the total productive age population</td>
<td>It assumed that people who depend their livelihood on the locality have higher resistance to evacuate during disaster or it becomes a constraint in a case of reducing exposure by resettlement program.</td>
</tr>
<tr>
<td>5a</td>
<td>Lack of Access to Water supply &amp; Sanitation (Specific to flood)</td>
<td>built up areas uncovered by water supply companies (Manila Water &amp; Maynilad)</td>
<td>Continuity of water supply and sanitation services during flood is very crucial for the survival of the community during or after disaster, and to prevent disease outbreak in the aftermath of flood.</td>
</tr>
<tr>
<td>5b</td>
<td>Dependency to Natural Resources (Specific to landslide)</td>
<td>Percentage of population work as farmers, forestry workers and fisherman out of the total productive age population</td>
<td>Most of people who work as farmers, forestry workers and fisherman whose livelihood depends on natural resources, located in the upstream river basin or upland forest. These upland areas are prone to landslide therefore this population is mostly affected during landslides. It is also related to income level or poverty.</td>
</tr>
</tbody>
</table>

This study employs 2 sub-indicators for Exposure and 5 sub-indicators for Vulnerability in determining flood and landslide risk. One exception is on one sub-indicator of vulnerability assessment in flood and landslide. Because it is assumed that factors that make people vulnerable to hazards could differ for each type of hazards. For example, the parameter of percentage of population work as farmers, forestry workers and fisherman is mainly applicable for upstream areas where those particular population reside and where the landslide disaster takes place. It is not applicable for flood disaster in Marikina River Basin due to the fact that only an insignificant number of population work as farmers, forestry workers and fisherman in the urbanized downstream where the flood struck.
Standardization of Parameters

The standardization of the parameters for the indicators includes defining ranges of values (class definition) and rating. Each of sub-indicators maps has attribute values, e.g. population density or building density values. These values need to be classified into several classes so that rating/index can be assigned to them. There are many variables or indicators used in this study and there is no universal standard in defining classes for the parameters or the attribute values of that indicators.

Under this uncertainty, it can be identified at least two alternative methods in defining classes. First, by utilizing the GIS software such as Arc GIS and let one of the tools in the application to define automatically the classes based on the available classification method. Example of this first approach is the five classes using quintile classification method in the World Risk Index 2011 report (Birkmann, et al., 2011). However, the critical question remains, which ranges of values of a certain variable that actually contribute significantly to the risk? This problem can be attributed to the fact that many studies or research projects were conducted in different locality, different spatial scales, with different condition of data availability.

The second approach, which is utilized in this study, is a combination of equal interval classification and manual interval classification by trying as much as possible to use existing available reference values used in the Philippines planning standard or practices, as one or more threshold values to be used the class/ranges definition. Examples are the population density classification by NSO and housing density classification in Zoning Ordinance. For every indicator and sub-indicators, the parameter values is classified into five classes with assigned index/rating ranging from 0-1 (0, 0.2, 0.4, 0.6, 0.8, and 1).

Assigning Weight for Indicators

The author is fully aware that ideally the weight for every criteria or indicator in Multi-Criteria Analysis (MCA) should be derived from an expert judgment approach such as the Analytical Hierarchical Process (AHP) or Delphi method. However considering the possibility that different experts have different perspective on risk and vulnerability, these expert judgment methods most likely will be less useful because of its inconsistency. The terms of Risk and Vulnerability are widely used in many fields with different perspectives that will result bias in judgments, for example between Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR) practitioners, or between social scientist and engineer. Furthermore, different studies in different location also vary in selecting the variables of risk and vulnerability due to availability of data and spatial scale or level of the project. Thus referring the weights from similar risk and vulnerability studies or projects in the past is very difficult if it is not possible.

In this study, differentiated weight was used in the SMCA for flood and landslide risk assessment. Weight assignment was mainly based on the rational judgment on how important or significant the indicators or sub-indicators in determining risk level, how approximate is the selected variables as proxy to indicator as whole, and how spatially accurate is the data representing the variables. The weight for indicators and sub-indicators varies and sum up to the maximum value of 100%. The
assigned weights to the components of Risk are: 45% for Hazard, 30% for Exposure, and 25% for Vulnerability.

Sensitivity Analysis

Sensitivity test was also conducted in the study to see how the utilization of different weights affecting the result of flood risk assessment. The test compared the flood risk map resulted from differentiated weight as discussed above with flood risk map based on the equal weight for whole indicators and sub-indicators. The comparison of the results shows that the differentiated weight is better in term of identifying the very high-risk areas or the top priorities areas, than the equal weight. There are areas that are located in high flood hazard level and known as informal settlers areas (the most vulnerable part of the society), which are not identified as very high risk areas in the flood risk map based on equal weights.

The complete analytical framework of GIS-assisted multi-criteria analysis for flood and landslide risk assessment can be seen in the Figure 3 provided below.

![Analytical Framework of SMCA for Flood Risk Assessment](image)

**Figure 3. Analytical Framework of SMCA for Flood Risk Assessment**

2.3. SMCA for Vulnerability Assessment of Surface Water to Pollution

Essentially, there are two main category of surface water pollutant, the point sources, which is the pollution with specific point of discharge (e.g. direct discharge from industry) and the non-point sources, which is cumulative inputs from across a wide area of the catchment, generated during rainfall-runoff events (e.g. forest, soil erosion, livestock wastes, pesticide and fertilizer from agricultural land) and transported by erosion.

The analytical framework of SMCA for vulnerability assessment of surface water to pollution in Marikina River Basin is based on principle as described above. The first stage is to analyze spatially each of the pollutant components, point and non-point
sources. The point source is represented by the density of industrial location in the study area. The specific point of discharge coming from built up areas that are uncovered by integrated sewage management is unidentifiable or tend to scattered, thus the domestic source is treated under non-point sources dominant pollution. The assumption is that if the built up areas are not within Manila Water and Maynilad services coverage, then these areas probably discharge untreated wastes to water body. While for the non-point source, it is analyzed using three main sub-indicators, namely; vulnerability to soil erosion, Land use/Land Cover (LULC) type, and the proximity to rivers and creeks. The second stage is to aggregate each of sub-indicators of point and non-point sources to derive overall basin vulnerability to surface water pollution. The non-point source is given higher weight in the analysis because it is composed of agricultural and domestic wastes, which are the biggest contributor according to the monitoring data of LLDA. Higher vulnerability represents higher potential in polluting the surface water. The detail framework of the analysis is provided below.

Figure 4. Analytical Framework of SMCA for Surface Water Vulnerability Assessment

Vulnerability Assessment to Soil Erosion is part of components or sub-indicator for non-point sources indicator. The chosen model is based on the universally accepted model in predicting soil loss known as Universal Soil Loss Equation (USLE) (Wischmeier & Smith, 1978). It is expressed as follows:

\[ A = R \times K \times L \times S \times C \times P \]

(2)

Where:
- \( A \) = annual soil loss (tons/ha/yr);
- \( R \) = rainfall erosivity;
- \( K \) = soil erodibility;
- \( L \times S \) = topographic factor (slope length and gradient);
- \( C \) = land cover factor or crop and management factor;
- \( P \) = erosion control factor or conservation supporting practices factor.
The weight for each of the USLE parameters for the SMCA, generally follows the recommended weight by the manual published by DENR of the Philippines (ERDB-DENR, 2011). LLDA study in 2008 confirmed that the major contributor of surface water pollution (BOD, P, N) in the study area is domestic sources with percentage values ranging from 78.8% to 90.70%, followed by industrial sources ranging from 3.93% to 12.80%, and agriculture sources 5.21% to 8.15%, while the rest are from forest. Weight assignment in SMCA for surface water vulnerability, generally based on condition mentioned above. Overall, the point source pollution is given weight 25% while non-point source is 75%. In details, erosion 35%, Land Use contributors 40% and proximity to water body 25%.

2.4. SMCA for Vulnerability Assessment of Groundwater to Contamination

Vulnerability refers to the sensitivity of groundwater to contamination, and is determined by intrinsic characteristics of the aquifer. The numerous methods in conducting vulnerability assessment of aquifer or groundwater, they generally fall into three categories, namely; 1) overlay and index methods, (2) methods employing process-based simulation models, and (3) statistical methods (CGER, 1993). Sophisticated and complicated models may not necessarily provide reliable outputs for planning purposes at regional scale as in this study.

Under the consideration of size or the spatial scales of the assessment area, the availability of data and the easiness to be replicated in other location, the study selected the overlay and index method for assessing the vulnerability of Marikina River Basin. The selected model called DRASTIC with some modification adjusting to the study area. This is probably the most widely used vulnerability assessment model for groundwater in the United States and in the other parts of the world, e.g. in Japan (Babiker, Mohamed, Hiyama, & Kato, 2005) and India (Rahman, 2008). The U.S. Environmental Protection Agency (EPA) developed the model, and it is based on the hydro-geological setting that affects and control groundwater movement or water transport from soil surface to the aquifer (Aller, Bennet, H.Lehr, Petty, & Hacket, 1987). The model’s name, DRASTIC, is actually stands for the seven variables considered in the model, namely: Depth to water, net Recharge, Aquifer media, Soil media, Topography, Impact of vadose zone media, and hydraulic Conductivity of the aquifer. The DRASTIC parameters are weighted and then summed to come up with a vulnerability rating or index. The higher values of the DRASTIC index represent greater vulnerability of the aquifer in that particular location. It is simply calculated as follows:

\[
D\text{rastic Index} = DrDw + RrRw + ArAw + SrSw + TrTw + IrIw + CrCw
\]

(3)

Where

- \( w \) = weight
- \( r \) = rating/score

Besides the seven variables of DRASTIC model, this study incorporate additional variable, which is the proximity or the presence of fault line. Since fault line also can
contribute to higher potential for recharging groundwater. Due to the relatively impermeable soil and geological characteristics of the study area, especially in the upstream, the other possibility for the water to percolate to groundwater is through fractured zones. While in downstream or western part, by comparing the geologic section and the depth to groundwater surface, it can be seen that the Marikina Valley Fault System (MVFS), extend down to the groundwater aquifer system. These geologic structures serve as conduit of recharge water directly into the aquifer system and are considered vulnerable to pollutants (NWRB, 2004). Therefore, the spatial extent or location with high potential as recharge areas are also the most vulnerable areas to contamination. This is because in these particular areas, the contaminant will infiltrate and percolate much faster to the aquifers.

Besides modification by adding faultline variables, other adjustments have to be made due to spatial data condition and availability to fulfill the seven variables of the original DRASTIC model. Weight assignment in this study also generally follows the DRASTIC weight but with slight adjustment, because the number of variables become eight instead of seven as in the original model. Overall analytical framework can be seen below.

Figure 5. Analytical Framework of SMCA for Ground Water Vulnerability Assessment
3. Results

3.1. Flood Risk

The Proposed Alternative Flood Hazard Map in this study was derived by combining the WB & DPWH flood map with MGB Flood Map, and assigning the hazard level. The Landslide Hazard Map is modified from Geo-hazard Map of MGB. Combining them as multi-hazard map (flood and landslide), it shows that almost half (44%) of the basin is highly susceptible to landslide, mostly located in the upper part such as in Antipolo City and Municipal of San Mateo and Rodriguez. While more than half of the downstream area, mostly in Cities of Marikina, Quezon, and Pasig, is highly susceptible to flooding. In term of exposure, population and building density are significantly concentrated along Marikina River, especially in the lower part, thus higher exposure to flood disaster. While for the vulnerability, as we scrutinized from downstream (near or within Metro Manila) to the upstream (Province) of the basin, the dependent population (children and elderly) and population with low education level are increasing.

The resulted flood risk assessment is composed of five risk levels, namely very low, low, moderate, high, and very high. From the Figure 7, several hot spots or the very high-risk areas can be identified, namely (from lower to upper); Barangay Kapasigan and Santolan (Pasig City) and Barangay Industrial Valley Complex (Quezon City). Most of the barangays along Marikina River in Marikina City especially Barangay Malanday, Tumana, and Nangka; Sta. Ana, Guiniling Bayan I & III (San Mateo); and Barangay Manggahan (Rodriguez). Most of these barangays are located in Marikina and Nangka Sub-watersheds.

After validation of these identified Very High Flood Risk areas using high-resolution satellite images from Google Earth, it shows clearly that most of those areas are settlement located right next to Marikina and Nangka Rivers. The images depicted very dense building areas with irregular road pattern similar to the characteristics of slums or informal settlements. Cross checking with the data from Marikina City Settlement Office, Barangay Tumana and Malanday are indeed among the targeted informal settlers to be relocated. For example, the data from that office shows that there are 7,015 households of informal settlers in Barangay Tumana. Until this point, the resulted flood risk map derived from the SMCA analytical framework is proven logical.
Figure 7. Combined Flood and Landslide Risk Map

Flood Risk Assessment to Support Risk Prioritization, Spatial Planning, and Flood Risk Reduction Policy Making

Based on the resulted flood risk assessment, there are several hot spots or the very high-risk areas. These are the top priority areas to be managed spatially and for DRR measures, or in other words the risk maps act as reference for targeted areas and for scaling priorities which locations that need immediate policies intervention. Some alternative measures include; altering land uses, strict Zoning Ordinance (ZO) or Zoning Regulation & Building Codes implementation, resettlement, flood control structures, awareness rising (IEC) programs, and evacuation plan, and others. Which measures to be undertaken will be depending on stakeholders consensus on how to manage to the risk condition, whether by relocation (preventing exposure), adaptation (reducing vulnerability), or by protection (mitigating hazard and reducing exposure). Spatial planning with its “tradition”, has well established multi-
stakeholder participation that enable promoting broader participation in the plan making process. Therefore, it provides a perfect medium of consensus building among stakeholder on Disaster Risk Reduction (DRR) policies especially policies that have spatial dimension or implications.

<table>
<thead>
<tr>
<th>FLOOD RISK ASSESSMENT</th>
<th>RISK-SENSITIVE SPATIAL PLANNING &amp; RESILIENCE POLICY</th>
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<tbody>
<tr>
<td><strong>FLOOD RISK MAP</strong></td>
<td><strong>Policies for DRR/ Resilience</strong></td>
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<td></td>
<td><strong>Risk Prioritization / Priority Areas</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Deinination of Risk Zones and definition of land-use for different risk zones</strong></td>
</tr>
<tr>
<td><strong>Hazard Map</strong></td>
<td><strong>Relocation</strong></td>
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<tr>
<td>* Inundation Areas</td>
<td><strong>Adaptation</strong></td>
</tr>
<tr>
<td>* Flood Depth</td>
<td><strong>Protection</strong></td>
</tr>
<tr>
<td>* Probability (return period)</td>
<td></td>
</tr>
<tr>
<td><strong>Exposure Map</strong></td>
<td><strong>Upstream land use planning: i.e. forest preservation zones</strong></td>
</tr>
<tr>
<td>* Population Density</td>
<td><strong>Dimensional land use planning: preserving wetlands, definitions of high risk or flood plain zones (floodes &amp; flood plains), buffer zones and water retention areas, zoning and development conditions to limit surface sealing</strong></td>
</tr>
<tr>
<td>* Building Density</td>
<td><strong>Incorporation of flood control structures in the spatial plan (dams, embankments, etc.)</strong></td>
</tr>
<tr>
<td>* ...</td>
<td><strong>The usage of flood hazard map is the land suitability analysis</strong></td>
</tr>
<tr>
<td><strong>Vulnerability Map</strong></td>
<td><strong>Enforcement of zoning, regulation, building codes, minimum heights of building, flood proofing materials, development and land exchange control</strong></td>
</tr>
<tr>
<td>* Dependent population</td>
<td><strong>Altering the land use allocation, making space for flood prone areas and resettlement program</strong></td>
</tr>
<tr>
<td>* Education &amp; Income Level</td>
<td><strong>Incorporation of flood control structures in the land use / spatial plan</strong></td>
</tr>
<tr>
<td>* Dependency to locality</td>
<td><strong>Facilitation of participation and conflict resolution among different spatial stakeholders</strong></td>
</tr>
<tr>
<td>* Access to Water</td>
<td><strong>Implementation of land use plan through incentives &amp; disincentives (preferential taxation for desired land uses, extra taxation for undesired land uses)</strong></td>
</tr>
<tr>
<td>...</td>
<td><strong>Spatial allocation or siting evacuation and emergency shelters, medical facilities, evacuation routes and early warning system.</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Incorporation of water supply and sanitation, education facilities, in the plan</strong></td>
</tr>
</tbody>
</table>

**Figure 8. Framework for Integrating Disaster Risk Reduction (DRR) into Spatial Planning**

Sources: Author’s construct, based on (Camphuis, 2007; Howe & White, 2004; Pottier, et al., 2005; WMO, et al., 2008)

Framework for Integrating Disaster Risk Reduction (DRR) into Spatial Planning as provided above, illustrated how Integrated Flood Management (IFM) can be promoted through spatial planning and how risk assessment by using SMCA can provide valuable input. The framework promoted the key elements of IFM, such as adopting mix of strategies (structural and non-structural measures), managing risk, ensuring participatory approach, and adopting multi-hazard management (flood and landslide).

### 3.2. Surface Water Vulnerability

The result of vulnerability assessment of surface water to pollution is a map depicting the degree of potentiality of areas in the basin in contributing to pollution whether from point sources or non-point sources. Most of the high contributor areas are located in Marikina Sub-watershed especially along Marikina River, in east and south west part of Nangka Sub-watershed, west part of Maly and Ampid sub-watershed, and southern part of Montalban sub-watershed.
3.3. Groundwater Vulnerability

A vulnerability assessment of groundwater to contamination with graphical representation (maps) will help planners and decision makers in evaluating and selecting the land use options. By combining that vulnerability map with the existing potential contaminant contributor, the indicative pollution risk can be determined. This vulnerability map can be used to identify the appropriate planning controls or what type of activities or land uses that can be allowed to protect groundwater quality. Example will be in site selection analysis for facilities with high potential polluting ground water, for example dumpsites, graveyard, etc. Furthermore, the most vulnerable areas to contamination are also the high potential areas for groundwater recharge. Therefore, controlling or altering the land use on those location, not only contributing to groundwater pollution prevention (water quality),
buat also increasing the quantity of groundwater, and mitigating land subsidence in the downstream.

The result of vulnerability assessment of groundwater to contamination shows that the areas of very high vulnerability are mainly concentrated in western part of Ampid and Maly Sub-watershed and upper part of Marikina Sub-watershed. In terms of administrative coverage, the areas are located in San Mateo, Rodriguez and Quezon City. From potential risk perspective, most of the cemeteries/graveyard and dumpsites are located in moderately vulnerable areas, except for Payatas Sanitary Landfill site that is located in highly vulnerable aquifer.

Figure 10. Groundwater Vulnerability Map
3.4. Common Spatial Focus between Flood Risk Reduction and Water Quality Management to be integrated into Spatial Plan

By overlaying the maps of high and very high risk and vulnerable areas to flood, surface water pollution and groundwater contamination, the common spatial focus among those water concerns can be identified. Most of the locations are distributed in the Marikina subwatershed and Nangka subwatershed. This information can serve as input for decision making in determining appropriate land use options that can tackle flood and water resources concerns simultaneously. This common spatial focus is the priority areas for “making space for water” policy. An example perhaps altering the land uses of those identified areas to become multi-purposes ponds or multi-purposes green open spaces. By selecting that option, it will significantly contribute to flood risk reduction because the hazard and exposure can be reduced, groundwater recharge will be increased because more infiltration and percolation become possible, and pollution to surface water will be lesser. This option also aligned with the principle of maximizing the “benefit” of flood for recharging groundwater, or in other words realizing the potential of Spatial Planning in achieving Integrated Flood Management (IFM) objectives.

Figure 11. Priority areas for Flood Risk Reduction and Water Quality Management (Common Spatial Focus)
4. Conclusions

Spatial planning has important roles in disaster risk reduction (DRR). Disaster mitigation-based spatial / land use plan simply means positioning spatial plan as a tool for disaster risk reduction. The integration of DRR into spatial plan implies shifting paradigm on disaster perspective from reactive to a more proactive framework, from previously technical and engineering approach into non-structural measures, from single hazards approach to multi-hazards, and from focusing on hazard prone into addressing risk components comprehensively including giving equal emphasis to vulnerabilities and capacities. By using this perspective in land use / spatial plan making, the key elements of Integrated Flood Management (IFM) can be promoted.

The framework and the result of SMCA in this study revealed the common spatial focus or the most sensitive areas to be targeted and would need special treatment/regulation in the land use plan/zoning in order to maintain the water resources sustainability (quality and quantity, surface and ground water) and to reduce the water-related disaster risk. In other words, these areas are the spatial requirements to promote Integrated Flood Management (IFM). The SMCA framework provide the practical but powerful to implement the integration of IFM into spatial planning. The common spatial focus is the priority areas to support “making space for water” policy and this policy can be considered as one of the strategic step toward IFM.

Recommendation

The principal recomendation will be to formulate Marikina River Basin Land Use/Spatial Plan which incorporate the basin-wide flood management measures (e.g. structural & non-structural) and water resources management measures (e.g. mitigation of surface and groundwater pollution and protection of groundwater recharge areas). Promotion of “Making space for water” policy in this river basin land use plan can be done by incorporating the result of SMCA for flood risk and water vulnerability (surface and ground water). These spatial measures can be done through differentiated zoning system in the flood plain (flood way and flood fringe definition) and in certain areas which are critical (high risk/high vulnerability) for the water concerns, and applying specific legends in the zoning map. The risk and vulnerability level also can be used for determining prioritization of areas and staging the intervention.

These recommendation are crucial to promote a risk and water-sensitive river basin land use plan. It can be utilized as guidance/directive for the six local land use plans (CLUPs) within the basin during the plan-making, and it also act as consideration for Provincial Land Use Commitee (PLUC) or HLURB during the review and approval of those local land use plans.
Acknowledgement

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References


AN OVERVIEW OF AIRPORT PRICING IN INDONESIA

Fadrinsyah ANWAR¹, PRADONO², Heru PURBOYO³, Ofyar Z. TAMIN⁴

Abstract
There was lack of capacity for many airports in Indonesia. Congestion problems such as flight delays and long queues at the check-in counter had become a key issue for the managers of a commercial airport. Many things needed to be considered before making a decision to increase the facilities, because the value of the investment required developing the airport was huge while the future demand of traffic was still uncertain. Issues in the determination of airport charges policy arises because of capacity constraints. This paper aimed to describe the airport pricing practice in Indonesia. The research methodology included the analysis of policy document and literature review. Through assessment of aspects of operational, financial and legal, the airport pricing in Indonesia was described.

Keywords: Airport Pricing, Capacity, Services

1. Introduction

In Indonesia, the growth of average national air passenger traffic within the last five years was 15.4% for domestic flight and 12.8% for international flight (DGCA, 2011). This increase is due to several factors such as the driver of national economic growth, an increase in foreign investment and the impact of market liberalization. However, the increasing of users of air transport services are not anticipated by increasing of airport capacities. There are more than ten commercial airports that have capacity problem, particularly in the use of the terminal, such as Soekarno-Hatta/Jakarta which have over capacity level by 234%, El Tari/Kupang 357.6%, Adi Sutjipto/ Yogyakarta 336.36%, S.S. Kasim II/Pekanbaru 271%, Hussein Sastranegara/Bandung 245.71%, and Ahmad Yani/Semarang 222.32%. (AN, 2012). The airport management always believe the need to find ideal conditions, where the fulfillment capacity and to meet the level of standard. On the other hand, airport operator still need the certainty of return for the investment that has been spent for the development of the airport.

Airport Pricing is the decision taken by the airport operator, in determining the amount of fees to be paid for services provided to users (airlines and passengers). Airport pricing becomes a crucial issue since beginning the era of commercial airports models. Changes in the model airport from "Traditional" to "Commercial"

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make the airport tariff issue became more complex and market based. The airport become more commercial and competitive, so the problems that arise such as capacity constraints, environmental concerns, and the cost of security, becomes important to be considered (Anne, 2008). Basically, airport pricing on commercial airports associate with the objectivity to be achieved, i.e. the social-welfare maximizing and profit maximizing. Many literature discusses how pricing associated with profit and social welfare, such as Zhang and Zhang (1997), Lu and Pagliari (2004) and Martin and Betancor (2006). Zhang and Zhang (1997) examine the pricing optimization problems by incorporating two kinds of revenue, i.e. revenue aeronautical and non-aeronautical revenue. The study results mentioned that pricing optimization can be achieved if the subsidies of the revenue derived from the operational activities concessions given to the operational aeronautical activities. He also explained that social welfare is also higher at the airport which explore profit from the operational of concession activities, compared to the marginal cost pricing imposed on the operational of concession activities. Another case conducted by Lu and Pagliari (2004), which examines social welfare associated with pricing policy of the single-till and the dual-till. Dual-till policy would be better applied to the condition of aeronautical capacity which reached a maximum level or exceed existing capacity. Conversely, when capacity utilization is low, single-till policy would be more appropriate. Comparing several models of airport charges is performed by Martin and Betancor (2006). They use models that have been studied previously for calculating social welfare, especially that obtained from the only the operational of aeronautical activities.

Currently, the commercial airports in Indonesia has reached 27 airports. Commercial airports in Indonesia are managed by state-owned enterprises which was formed specifically to manage commercial airports. The airport management will be more varied due to the enactment of Law No. 1 Year 2009 regarding Aviation. This law describes the subsequent separation of the function of regulator and operator at the airport. This law also explains that the airport charges is determined by the airport manager, while the government as regulator only determine the structure and the classification of airport charges. In addition, based on the existing tariff regulations, the model used airport charges are cost-based form with policy of dual-till. Costs divided proportionately, including the separation between aeronautical and non-aeronautical. While the calculation of revenue, it divide into aeronautical and non-aeronautical. Variable of airport charges is dominated by operating costs, which rising is generated by inflation factors, such as rising of supporting material for operational and dollar exchange rate.

The aim of this paper is to describe the airport pricing practice in Indonesia. The research methodology included the analysis of policy document and literature review. Through assessment of aspects of operational, financial and legal, the airport pricing in Indonesia was described. In next section, we explore about airport pricing and capacity management. After that, we discuss Airport pricing practice in Indonesia. The last section we take some important points from previous discussion to make conclusion.
2. Airport Pricing and Capacity Management

International Civil Aviation Organization (ICAO) has issued policy guidelines related to pricing at the airport, as in document ICAO's Policies on Charges for Airports and Air Navigation Services (Doc 9082/7). The document explains that the amount of airport charges is determined by the cost, or known as cost-based charging. The process for setting charges shall be in accordance with the accounting and costing principle. Based on economic theory, there are two cost types, i.e. short-run cost and long-run cost. Both of cost types is very influenced by traffic and capacity factors (Doganis (1992), Button and Stough (2000)). In assessment of cost factor, we consider short-run marginal cost (SRMC) and long-run marginal cost (LRMC), where have different analysis focus. SRMC is emphasized at how cost factor is influenced by operating cost of available capacities. In the other hand, LRMC is more emphasized at influence of long term investment (capital).

The airport is a form of natural monopoly, so the cost for terminal and landing services need to be controlled (Gillen et al., 2001). On the other hand, non-aeronautical service charges do not require rules or regulations. As described by Trethway (2001), the case in many countries, only the revenue service flight activity imposed pricing regulations, while the commercial services that have high levels of market competition does not require the pricing regulations. Basically, pricing regulation is used as guide for price design and adjustment mechanism. Several studies have been conducted to assess the airport pricing mechanism, such as Forsyth et al (2003), Basso (2008) and Currier (2008). They make researches to examine the pricing mechanism by making comparison. Forsyth (2003) examines the implications of the two forms of regulatory mechanisms governing the charges at the airport, i.e. the cost-plus and the price-cap. Each of these mechanisms was tested advantages and disadvantages, especially in terms of minimizing cost and maximizing profit. He found that price-cap mechanism has advantages compared with the cost-plus. The price-cap mechanism will provide incentives for tariff policy during rush hour, so it will be able to increase airport revenues. While, Basso (2008) examine how the policy of airlines can affect airport

Issues in the determination of airport charges arise because of capacity constraints. Variability of traffic that occurs can result in a lower or exceeds use of its existing facilities capacity. Many things need to be considers before making a decision to increase the facilities, in case facility usage exceeds existing capacity. It is because the value of the investment required to develop the airport is huge while the future demand of traffic is still uncertain. Uncertainty of traffic demand is influenced by many variables, such as changing of global economic and growth of technology. Managing of traffic growth issue can be done by arranged capacities slot allocation, or by pricing techniques (Button and Stough, 2000). There are some studies that examine capacity limitation issue related to pricing policy. Yuen and Zhang (2007) studied airport congestion issue through pricing approach, where the considered
factor is passenger time cost. In studying airport congestion problem use pricing approach as well as arrangement of slot allocation or capacity management, as in research done by Brueckner (2009) and Basso and Zhang (2010).

Airport pricing strategy concerning airport management in making decisions related to capacity building. To formulate appropriate pricing becomes important in order to reduce the existing level of congestion (Brueckner (2009), Button et al (2000) and Basso et al (2010)). Strategy taken in determining airport charges, strongly associated with the decision to address the issue of capacity constraints, whether a policy restricting the use of capacity, or by increasing the existing capacity. To expand the airport's capacity takes a long time, while the available capacity should be able to anticipate the needs of up to 10 years (Donganis (1992)). Airport pricing strategy for the treatment of airport congestion can be seen at how the airport manager take the strategy in determining the policy related to operational and asset/capital (Niemeyer (2009)). Some things that can be done concerning airport operations, such as adding staff at the services or security unit, improve the effectiveness of the service system at the airport, adding operational support equipment in the terminal, minor construction on the air side, and adding or setting up a terminal facility. While involving asset/capital is the policy to build or to add existing facilities in the context of long-term, such as the construction of a new terminal and additional runways.

3. Airport Pricing in Indonesia

In the Law No. 1 Year 2009 regarding Aviation, services at airports is divided into two types, i.e. airport services and airport related services. Airport services are airport essential services, which are directly related on aircraft, passenger, freight, and mail services. While airport related services are services that support airport operation activities. Principal thing that distinguishes between two types of services are related to tariff setting for services provided to users. Tariff for airport services is given by airport manajer, while the structure and the classification of tariff are set by the government. On the other hand, tariff for airport-related services is set directly by the airport manager. Tariff setting for airport services is a manifestation of the government's responsibility to provide guidance in the determination of tariff that should be done by the airport manager. Tariff structure and class airport services, is still refer to the Minister of Transportation Decree No. KM 29/1997. Airport services tariff structure, a frame rate that is associated with, the order of time, and the unit of measure, from any type of airport services provided by the airport operators. Order time and the unit of measure of each type of service, defined as follows:

a. Aircraft landing services, is calculated based on aircraft weight in tonnes of Maximum Permissable Take Off Weight (MTOW) for the one-time landing at airports without limitation, and tonnes of Restricted Pennissable Take Off Weight (RTOW) at airports with restrictions
b. Aircraft Services Placement Services, is calculated based on aircraft weight in tonnes of Maximum Take Permissible Off Weight (MTOW) and unit time per visit.

c. Aircraft Storage Services, is calculated based on aircraft weight in tonnes of Maximum Permissible Take Off Weight (MTOW) and units of time per day.

d. Passengers care services, is calculated based on passenger aircraft departing in units per passenger per one departed.

e. Flight services to aircraft landing and/or departed and who making flight through, is calculated based on the route-unit which is multiple between factor of aircraft weight (MTOW) and flight distance factor.

f. Counter Service Uses, is calculated based passenger who depart from airports in units per passenger per one departure.

g. Garbarata Service Uses (Avio Bridge), is calculated based on aircraft weight in tonnes of Maximum Permissible Take Off Weight (MTOW) for one time use.

The categories of airport services charges are set based on the type of service airports, classification and available facilities at the airport. The tariff rate categories is a tariff that is set for each airport or group of airports, in accordance with airport class and the type and level of airport services. Pricing principles of airports in Indonesia currently refers to the guidelines published by the ICAO, which uses the principle of cost-based charging. This pricing principle implies several factors that affect pricing at the airport. Traffic is a major factor that greatly affects the pricing parameters. Airport pricing, strongly influenced the problems of capacity constraints. This is because the effect of the variability of traffic which can result in the level of use of existing facilities to be low or exceeds the capabilities of the existing capacity. Overcome the limitations of capacity by adding new facilities, is not something that can directly address the problem. Many things must be considered before deciding whether airports should be developed or not. This is because the value of the investment required, while the next future traffic demand is uncertain. Accurate forecasting of traffic needed to justifikasi basis in the preparation of corporate plan. Capital investment decisions, such as the development of additional facilities and equipment as well as increased operational capacity such as the addition of employees, increased hours of operation and so on, refer to the minimum service standards, which need to be provided by the operator. Besides decisions related to timing issues, it is also necessary studies and decisions, in determining the allocation of costs. The tariff setting process is using accounting and financing principles. Tariff setting process is conducted through a series of cost transformation process, starting from the types of costs incurred, up to divide it into the form of unit cost. In this process, the management skills needed to perform the cost allocation appropriately and effectively. As uncertainty theory, every decision has a risk. the risks that may arise due to inaccuracies in the determination of the timing of decision-making, and the value of investments and the allocation of costs, was a loss or a negative impact on the company financial performance. Furthermore, these costs will be charged to the user in the form of airport charges. While the tariff itself, is calculated by considering the rates, as a factor of production. The process of determining the airport tariffs can be seen in Figure 1.
Figure 1. The Process of Determining Airport Service Charges

Service quality can also affect the pricing because these factors involve the user in assessing the reasonableness of the tariffs for services. According to Graham (2008), quality of service at the airport can be measured from two different viewpoints, i.e. objective indicators and subjective indicators. Objective indicators are used to determine and measure the level of service based on the value that can be quantified, such as the time of check-in process, dimension of service area in the terminal, and so on. While subjective indicators are used to determine and measure the level of service based on a qualitative value based on the perception of service user satisfaction that the service is received from airport operators. If the views of the party providing the service level assessment, the objective indicators are generally assessed from the perspective of management or airport management, while the assessment is based on subjective indicators of service users (Graham, 2008). Influence the level of service on tariff can be seen from several references. International Air Transport Association (IATA) has implemented how an airport plan takes into account service level parameters, especially the long queues and waiting time at the service area in the terminal (Graham, 2008). Similarly, Indonesia's aviation law states that the airport charges can be lowered if the airport operators do not provide services accordance with airport standardization. In addition, an assessment of the quality of airport services has also been used as a parameter, in the calculation of the airport charges.

4. Discussion

Indonesia's aviation regulatory had change since enacted Law No. 1 Year 2009 concerning Aviation. The important thing is arranged in this law is giving greater opportunities to the private sector and local governments to participate in airport development and management. Furthermore, this law set a strict separation between
the functions of regulator and operator in the development and operation of airports. Other things that arranged is the requirements, procedures and standards of airport affairs, the order of the national airport affairs, determining the location, operation, facilities and airport personnel, local control of the workplace, and flight operations safety area. However, the below rules that regulate the structure and categorize charges at the airport, as well as tariff setting mechanism and formulation of tariff calculation airport, is still use the ministerial transport degree No. KM 29 Year 1997 and the ministerial transport decree No. KM 28 Year 1999, which was made at the time the new law, has not been issued. Many things need to be assessed and evaluated against the rules, especially related to tariff setting mechanism.

The existing pricing models are used at airports in Indonesia is cost-based with the policy of dual-till. In cost-based pricing models, airport charges is set so the revenue generated can cover existing expenses (ICAO, 2009). According to Niemeier (2009), this pricing model has advantages and disadvantages. The advantage is that the airport will not lose money. Meanwhile, the disadvantage is that there is no incentive for managers to plan the development of airport facilities in peak condition. Thus the pricing policies are that applied to existing commercial airports, can be assessed its pricing efficiency. This is important, because the operational costs of managing airports require substantial funds. Similarly, dual-till policy which applied to airports in Indonesia needs to be assessed whether the social-welfare maximum can be achieved or not. The figure 2 and table 1 present comparative operating margin and revenue structure from five commercial airports, as an illustration of the financial condition of some of the commercial airports in Indonesia.

Figure 2. Operating margin (2011)
Source: (AP I, 2012) and (AP II, 2012)
### Table 1. Revenue Structure of Five Airport (2011)

<table>
<thead>
<tr>
<th>Airport &amp; Location</th>
<th>Aeronautical Revenue</th>
<th>Non-Aeronautical Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polonia-Medan</td>
<td>83%</td>
<td>17%</td>
</tr>
<tr>
<td>S.S. Kasim II - Pekanbaru</td>
<td>74%</td>
<td>26%</td>
</tr>
<tr>
<td>Supadio - Pontianak</td>
<td>73%</td>
<td>27%</td>
</tr>
<tr>
<td>Juanda - Surabaya</td>
<td>69%</td>
<td>31%</td>
</tr>
<tr>
<td>Sepinggan - Balikpapan</td>
<td>70%</td>
<td>30%</td>
</tr>
<tr>
<td>Hasanuddin — Makassar</td>
<td>64%</td>
<td>36%</td>
</tr>
</tbody>
</table>

*Source: (AP I, 2012) and (AP II, 2012)*

From Figure 2, we can indicated that the operating margin for five airport is positive. However, this has not been able to show how the pricing efficiency of the airports. Similarly, when see the structure of income of five commercial airports, indicated that revenues from aeronautical operations look very dominating, compared with revenues from non-aeronautical activities or commercial activity, with the comparison ratio is 79%: 21%. Thus, the role of regulation on airport tariff is an important thing to be studied, in order to answer whether existing regulations, is appropriate? How much the level control over these regulations?

Based on these things, this paper suggests some points that can be drawn up such as:

1. Need to make in-depth study that resulted in a good policy on how airport charges should be set in order to get social welfare maximalization.
2. Need to make study for choosing appropriate airport pricing regulation in Indonesia, in order to provide incentives for airport operators to improve efficiency, as well as for the government to be able to supervise the implementation of pricing policy effectively.

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STUDY OF COST AND TARIFF IN COMMUNAL WATER PROVISION
AT BANDUNG URBAN AREA

Purwa Cipta LENGGANA¹, Heru Purboyo HidayatPUTRO²

Abstract

Tendency of population in urban areas will create a new demand for additional infrastructure, particularly in the periphery (peri urban). However, population growth often not accompanied by adequate urban infrastructure growth, such as water services. On the other hand, the ability of local governments to provide public services, especially water is still limited. Many groups of people try to survive the limitations by organize a communal water service system, characterized by small-scale and limited service. Communal water supply grow as an alternative to formal water supply with a different management of each community. Characteristic diversity of communal water providers make difference, in terms of cost management, or on communal water tariffs. The purpose of this study is to describe costs and tariffs of communal water supply systems in Bandung Urban Area. This research describe communal water supply conditions related quality, quantity, continuity, maintenance costs and tariffs. This study is a qualitative research by using content analysis. The findings are based on ten communal water providers in Bandung Urban Area. Data collection tools included document review, interviews and observations. This paper demonstrates that the communal water providers can achieve a good performance with a low cost and cheap tariffs. It is closely linked to providers characteristic who consider the condition of the water source, technology used, the role of the organization, community participation, and social capital of the community. Recommendations given in the study include improvements in internal providers, aggregation and replication.

Keywords: Communal water system, Cost and tariff, Peri urban

1. Introduction

Water is one of basic human need. When population increased, the need of clean water will become greater. Unfortunately, population growth is often not accompanied by the development of water infrastructure, especially in peri urban areas. One of the reason is limited access to formal water providers. People who did not have access to formal providers searching for alternative water service. They

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provide water individually, and communally. A communal water supply is preferred than individual water supply due to the effectiveness in terms of development costs (Allen et al, 2006). In Indonesia, communal water supply is still not controlled by the government, this is caused by the lack of control from communal water supply performance, both in terms of quantity, quality and continuity. In addition, communal water supply in urban areas is scatter around the city and they have a wide range of characters, so some differences from each provider can be found, including in terms of costs and tariffs in the provision of clean water. Previously, Kyessi (2001) have also found difference in water tariff between informal water providers in developing countries.

With limited research on communal water supply, study-related costs and tariff being essential to improve water provision for the community. Substative benefits of this research including internal review of communal water provision, external replication for providers who implementing low costs, cheap tariff also with good performance, and becomea formulation of water provision institutional cooperation. The purpose of this study is to describe costs and tariffs of communal water supply systems in Bandung Urban Area. This study target information about performance of the communal water supply at Bandung Urban Area and the value of cost and tariff of communal water supply at Bandung Urban Area.

Scope of this study is at Bandung Urban Area, including Bandung City and Bandung Regency. Bandung City is served by PDAM Tirtawening as formal water providers with 72.19% coverage in 2013 (PDAM Tirtawening, 2013). Bandung Regency is served by PDAM Tirtaraharja as formal water providers with 59.3% coverage in 2013 (PDAM Tirtaraharja, 2013). Region that did not served by formal water providers is scattered around peri urban area. Peri urban area is an expansion area of the city that has urban and rural character. In Indonesia, there is no standard regarding the delineation of peri urban areas. However, there are some delineation, including by The West Java Province Metropolitan Development Management (WJP MDM) which classifies Bandung Metropolitan Area. Based on WJP MDM and Raperpres Cekungan Bandung, Humaira (2013) classifies the Bandung Metropolitan Region into 3 parts, the urban core areas, peri urban areas and rural areas.
In Figure 1, urban core area is indicated by the red color, peri urban area is indicated by the yellow color. While the green color is a rural area. Criterias used for the selected case study in Bandung Urban Area are communal piped water supply and managed by the community. Using sownball methods, ten case study selected, four of them located in Bandung City, namely Rancakendal Resident, Griya BumiArcamanik Resident (KomplekPos), RW 06 KelurahanBabakanCiparay, and RT 12 KelurahanKarasakKecamatan Astana Anyar. Six case study located at Bandung Regency, including Komplek BumiAsri III, KomplekBumiAsri V, RW 05 Bukitligar, Taman Melati Resident, Griya Bukit Mas II, and RT 02 KelurahanPasawahanKecamatan Dayeuhkolot. Cost that will be discussed in this study is operational and maintenance cost. For tariff, this study will discussing fixed tariff, uniform tariff and increasing block rate tariff. As a point, this study describe communal water supply conditions related quality, quantity, continuity, maintenance costs and tariffs.

This study attempts to explain cost and tariff in communal water supply systems in Bandung Urban Area using inductive models. Research on communal water supply system, especially in Indonesia is still very limited. Therefore, the components of costs and tariff in water supply determined inexplorative, with referring to the formal water system provision. Value of each cost and tariff component obtained from a communal water providers at Bandung Urban Area. Several parameter is used to classify communal water provision performance in each providers. Standard from
the Minister of Public Works is used as quantity parameter with 60 liters/person/day as a minimum standard for consuming water and 126.9 liters/person/day to fulfill secondary water need. Quality assessment adopted Indonesian Health Minister No.492/MENKES/PER/IV/2010 about drinking water quality requirements, based on physical aspect. Continuities assessment adopted Keputusan Menteri Dalam Negeri No 47 Tahun 1999 about Guidelines for PDAM Performance Assessment. Value of cost in the communal water supply classified by price of aggregate water sold in one cubic meter. While value of tariff in the communal water supply classified by price of average water consumed in one cubic meter, based on tariff structure. Those three assessment is used to rank communal water providers in this study.

2. Analysis

Based on ten case study, this study obtained several overview of communal water supply system in Bandung Urban Area. Scope of water service in every providers is quite limited by serving RT, RW or several RW. Procurement can be pure by community, derived from developer and then transferred to community, or came from government aid. On this study, communal water providers are used groundwater and springs as a water source. Not every provider use the water meter. Community build a communal water supply due to the lack of a formal water supply network or inability to pay installation cost in formal water supply. In the maintenance phase, the developer had handed over communal water ownership and management to the community.

Initiator in communal water supply can affect the cost of planning and development as well as the applicable tariff. If developer is the initiator, generally people are not involved in the tariff calculation, so cost and tariff rigidly performed by experts. In addition, the construction cost of water supply is imposed on society evenly. In contrast to communal water supply systems that initiated by the developer, the provision which been initiated by the community, are generally applied the cross-subsidy system charging. They also can be assisted by the government. The provider could have dual function to fulfill their role. It can minimize the employee cost elements in the cost components. However, with less expertise, the function of another roles are often not achievable. In fulfillment of the role, there is an element of voluntariness, characterized by the roles that did not get paid with professional manner.

<table>
<thead>
<tr>
<th>No</th>
<th>Residential</th>
<th>Customer</th>
<th>Procurement</th>
<th>Water Source</th>
<th>Deep</th>
<th>Methods of Water Distribution</th>
<th>Water Meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bumi Asri III Resident</td>
<td>235 KK</td>
<td>Community</td>
<td>Springs</td>
<td>-</td>
<td>Gravity</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>Taman Melati Resident</td>
<td>170 KK</td>
<td>Developer-Community</td>
<td>Artesia Well</td>
<td>153 m</td>
<td>Pumping</td>
<td>Available</td>
</tr>
<tr>
<td>3</td>
<td>Griya Bumi</td>
<td>225 KK</td>
<td>Community</td>
<td>Drill Well</td>
<td>100 m</td>
<td>Pumping</td>
<td>X</td>
</tr>
</tbody>
</table>

Table 1. Communal Water Provision at Study Location
<table>
<thead>
<tr>
<th>No</th>
<th>Residential</th>
<th>Customer</th>
<th>Procurement</th>
<th>Water Source</th>
<th>Deep</th>
<th>Methods of Water Distribution</th>
<th>Water Meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Arcamanik Resident</td>
<td></td>
<td></td>
<td>Deep Well</td>
<td>76 m</td>
<td>Pumping</td>
<td>Available</td>
</tr>
<tr>
<td>5</td>
<td>Griya Bukit Mas II Resident</td>
<td>240 KK</td>
<td>Developer – Community</td>
<td>Drill Well</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>RT 02 Kel. Pasawahan</td>
<td>240 KK</td>
<td>Government aid - community</td>
<td>Artesian Well</td>
<td>120 m</td>
<td>Pumping</td>
<td>Available</td>
</tr>
<tr>
<td>7</td>
<td>Bukitligar RW 05 Resident</td>
<td>204 KK</td>
<td>Community</td>
<td>Drill Well</td>
<td>200 m</td>
<td>Pumping</td>
<td>Available</td>
</tr>
<tr>
<td>8</td>
<td>Bumi Asri V Resident</td>
<td>70 KK</td>
<td>Community</td>
<td>Artesian Well</td>
<td>100 m</td>
<td>Pumping</td>
<td>X</td>
</tr>
<tr>
<td>9</td>
<td>Rancakendal Resident</td>
<td>60 KK</td>
<td>Developer – Community</td>
<td>Artesian Well</td>
<td>100 m</td>
<td>Combination</td>
<td>Available</td>
</tr>
<tr>
<td>10</td>
<td>RW 06 Kel.Babakan Ciparay</td>
<td>110 KK</td>
<td>Government aid - community</td>
<td>Drill Well</td>
<td>100 m</td>
<td>Pumping</td>
<td>Available</td>
</tr>
<tr>
<td>10</td>
<td>RT 12 Kel.Karasak</td>
<td>9 KK</td>
<td>Government aid - community</td>
<td>Drill Well</td>
<td>36 m</td>
<td>Pumping</td>
<td>X</td>
</tr>
</tbody>
</table>

Source: Survey, 2013

Based on ten provider, four of them had high performance in water provision, while the other had a moderate performance. A high-performance provider has an average water distributed to meet consumer basic and secondary needs, which exceed 9 m$^3$ per month per customer. Water that has been distributed to consumer has a good physical quality (i.e.: clear, odorless, colorless and tasteless) and can be access easily. In general, communal water in high performance provider use communal water to be the main source of water. As for the providers with moderate performance, communal water is used as an additional water supply. Operation and maintenance costs consist of the routine cost and incidental cost. In this study, cost is calculated from a routine costs based on the volume of water produced. Providers with groundwater sources usually use the pump to capture water so it takes energy costs each month. Worker costs only exist in nine provider, while at RT12 Kelurahan Karasak, no worker costs are allocated, because the role had been taken voluntary by RT staff. Some other costs are allocated by each provider including taxes, levies and treatment cost.
Table 2. Performance Assessment at Study Location

<table>
<thead>
<tr>
<th>No</th>
<th>Residential</th>
<th>Indicator</th>
<th>Score</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Quantity</td>
<td>Quality</td>
<td>Continuity</td>
</tr>
<tr>
<td>1</td>
<td>Bumi Asri III Resident</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>2</td>
<td>Taman Melati Resident</td>
<td>High</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>3</td>
<td>Griya Bumi Arcamanik Resident</td>
<td>Moderate</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>4</td>
<td>Griya Bukit Mas II Resident</td>
<td>High</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>5</td>
<td>RT 02 Kel. Pasawahan</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>6</td>
<td>Bukitligar RW 05 Resident</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>7</td>
<td>Bumi Asri V Resident</td>
<td>Moderate</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>8</td>
<td>Rancakendal Resident</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>9</td>
<td>RW 06 Kel. Babakan Ciparay</td>
<td>Moderate</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>10</td>
<td>RT 12 Kel. Karasak</td>
<td>Moderate</td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>

Source: Analysis, 2013

On the cost assessment, value of cost in communal water supply are calculated from total routine cost based on water sold in one month. Rancakendal Resident has a highest cost compared than other providers with value of cost about three thousand rupiah to produce 1 cubic meter of water.

Table 2. Cost Assessment at Study Location

<table>
<thead>
<tr>
<th>No</th>
<th>Residential</th>
<th>Biaya Total/Meter Kubik Air</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bumi Asri III Resident</td>
<td>Rp 1425.53 rupiah/m³</td>
<td>Low Cost</td>
</tr>
<tr>
<td>2</td>
<td>Taman Melati Resident</td>
<td>Rp 1134.50 rupiah/m³</td>
<td>Low Cost</td>
</tr>
<tr>
<td>3</td>
<td>Griya Bumi Arcamanik Resident</td>
<td>Rp 1388.89 rupiah/m³</td>
<td>Low Cost</td>
</tr>
<tr>
<td>4</td>
<td>Griya Bukit Mas II Resident</td>
<td>Rp 1145.83 rupiah/m³</td>
<td>Low Cost</td>
</tr>
<tr>
<td>5</td>
<td>RT 02 Kel. Pasawahan</td>
<td>Rp 952.38 rupiah/m³</td>
<td>Low Cost</td>
</tr>
<tr>
<td>6</td>
<td>Bukitligar RW 05 Resident</td>
<td>Rp 996.63 rupiah/m³</td>
<td>Low Cost</td>
</tr>
<tr>
<td>7</td>
<td>Bumi Asri V Resident</td>
<td>Rp 1771.43 rupiah/m³</td>
<td>Medium Cost</td>
</tr>
<tr>
<td>8</td>
<td>Rancakendal Resident</td>
<td>Rp 3071.76 rupiah/m³</td>
<td>High Cost</td>
</tr>
<tr>
<td>9</td>
<td>RW 06 Kel. Babakan Ciparay</td>
<td>Rp 909.00 rupiah/m³</td>
<td>Low Cost</td>
</tr>
<tr>
<td>10</td>
<td>RT 12 Kel. Karasak</td>
<td>Rp 1481.48 rupiah/m³</td>
<td>Low Cost</td>
</tr>
</tbody>
</table>

Source: Analysis, 2013

At Rancakendal Resident, Rp 4,700,000.00 per month is needed to produce 1530 m³ of water. In contrast, RW 06 Kelurahan Babakan Ciparay capable using Rp 1,200,000.00 per month to produce 1320 m³ of water per month. Based on ten water providers, cost range is made in order to get a categorization. Low cost ranged Rp909-Rp1,630,000.00 /m³, moderate cost ranged Rp1,631,00-Rp2,350,00 / m³ and high cost ranged Rp2 .351,00-Rp3.072,00 / m³.

Table 3. Tariff Assessment at Study Location

<table>
<thead>
<tr>
<th>No</th>
<th>Residential</th>
<th>Biaya Total/Meter Kubik Air</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bumi Asri III Resident</td>
<td>Rp 5,833.00 rupiah/m³</td>
<td>High Tariff</td>
</tr>
<tr>
<td>2</td>
<td>Taman Melati Resident</td>
<td>Rp 3,336.00 rupiah/m³</td>
<td>Medium Tariff</td>
</tr>
<tr>
<td>3</td>
<td>Griya Bumi Arcamanik Resident</td>
<td>Rp 1,500.00 rupiah/m³</td>
<td>Low Tariff</td>
</tr>
<tr>
<td>4</td>
<td>Griya Bukit Mas II Resident</td>
<td>Rp 1,750.00 rupiah/m³</td>
<td>Low Tariff</td>
</tr>
<tr>
<td>5</td>
<td>RT 02 Kel. Pasawahan</td>
<td>Rp 2,057.00 rupiah/m³</td>
<td>Low Tariff</td>
</tr>
</tbody>
</table>

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On water tariff assessment, the value of tariff in each provider calculated based on the tariff structure and the volume of water sold. Based on ten case, the cheapest water tariffs gained by Griya Bumi Arcamanik with uniform tariff, about Rp 1,500.00 per cubic meter of water. The most expensive tariff is gained by Bumi Asri Regency with Rp 35,000.00 per month with fixed tariff structure distribute about 6 m³/household/month volume of water. Tariff range is made in order to get a categorization. Low tariff ranged until Rp 1,500.943.00/m³, moderate tariff ranged Rp 2,944.00 - Rp 4,389.00/m³, and high tariff ranged Rp 4,390.00 - Rp 5,833.00/m³.

Based in ten communal water providers, four providers has a low tariff category, namely Griya Bumi Arcamanik, Griya Bukit Mas II, RT 02 Kelurahan Pasawahan, and RT 12, Kelurahan Karasak. There are random pattern on the mapping of value of water cost and value of water tariff, customer and value of water tariff, water volume and value of water tariff. It is proved that the communal water supply have special characteristics in each provider that can affect the determination of water tariffs. Rank is made based on score of ten water provider.

It carried out that the biggest score owned by RT 02 Kelurahan Pasawahan with high performance, low cost and low tariff compared with other providers. RT 02 Kelurahan Karasak could be replicated by considering its special characteristics. At there, water sources is maintained, characterized by quantity, quality and continuity of water that can meet the need of customer. Water can be distributed 24 hours worth volume around 35 m³/household/month, odorless, colorless, and tasteless. Groundwater conditions at the site are still good, so by drilling 120 m, water could be produced to fulfill customer needs using pump and water meter. Providers is also well organized, has appropriate functions and role in the local management, also supported by expertise in the operation and maintenance. Community participation is also shown starting from the beginning of development, including dues of water supply installation and repairing damaged water infrastructure. Social capital was also demonstrated by the people with the willingness to voluntarily in performing maintenance of water sector. Community also believe in providers performance and willing to be involved to discuss about water.
### Table 4. Assessment of Performance, Cost and Tariff in Communal Water at Study Location

<table>
<thead>
<tr>
<th>No</th>
<th>Residential</th>
<th>Performance</th>
<th>Cost</th>
<th>Tariff</th>
<th>Cumulative Score</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bumi Asri III Resident</td>
<td>Med. Perf</td>
<td>Low Cost</td>
<td>High Tariff</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Taman Melati Resident</td>
<td>Med. Perf</td>
<td>Low Cost</td>
<td>Med. Tariff</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Griya Bumi Arcamanik Resident</td>
<td>Med. Perf</td>
<td>Low Cost</td>
<td>Low Tariff</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Griya Bukit Mas II Resident</td>
<td>Med. Perf</td>
<td>Low Cost</td>
<td>Low Tariff</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>RT 02 Kel. Pasawahan</td>
<td>High. Perf</td>
<td>Low Cost</td>
<td>Low Tariff</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Bukitligar RW 05 Resident</td>
<td>High. Perf</td>
<td>Low Cost</td>
<td>High Tariff</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Rancakendal Resident</td>
<td>High. Perf</td>
<td>High Cost</td>
<td>Med. Tariff</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>RW 06 Kel.Babakan Ciparay</td>
<td>High. Perf</td>
<td>Low Cost</td>
<td>High Tariff</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>RT 12 Kel. Karasak</td>
<td>Med. Perf</td>
<td>Low Cost</td>
<td>Low Tariff</td>
<td>8</td>
<td>2</td>
</tr>
</tbody>
</table>

*Source: Analysis, 2013*

#### 3. Conclusions

Based on ten communal water providers Bandung Urban Area, the provision of communal water is on the medium to high performance level. Provider with high performance communal water provision, using communal water as the main source of clean water. As for the medium performance provider, communal water is used as an alternative water source. In this study, been known that communal water supply could achieve a good performance with a low cost and cheap tariff comparing with other provider. However, these conditions cannot be separated from provision characteristic including the water source conditions, the technology used, the role of the providers on the organization, community participation and good social capital. From this study, recommendations can be divided into three parts, namely improvements in internal, service aggregation and replication of water supply provision.

a. ) Improvements in Internal

Improvements in internal communal water provision needed to obtained a good performance in water supply provision with low cost and cheap tariff. Improvements
can be done internally including in changing tariff structure. In addition, provider should also consider about the responsibilities of each role. Based on the results, BumiAsri III Resident has a lowest rank. This is because water tariff are considered too expensive when compared to nine other provider. At this provider, tariff structure is not suitable to use because there are customer who only get 4 - 10m3 of water per month with an average of 6m3 per month but should pay Rp35.000.00. Providers could use uniform tariff structure with water meter instalation. By doing so, the tariff paid by the customer is in accordance with received water. On Taman MelatiResident ,Griya Bukit Mas Resident , GriyaBymiArcamanik Resident and BumiAsri V Resident, deficiency are at in terms of continuity and quality. Quality could be improved by allocating treatment cost.

b . ) Service aggregation

Aggregation is needed to improving providers services range, so customers can increase. Based ten communal water provider at Bandung Urban Area, aggregation may be made on Bukitligar RW 05 , RT 02 KelurahanPasawahan and Taman Melati Resident. Those provider can provide water supply exceeds average customer basic and secondary need, 19.35 m3. On the other hand, those providers not only covers local area. The aggregation needs to pay attention to the spatial conditions of the provider. Aggregation for Bukitligar RW 05 Resident and RT 02 KelurahanPasawahan are possible for nearby areas from the provider. The new customer should be lower from provider so gravity system can be used to distribute the water.

c. ) Replication of Water Supply Provision

One of ten communal water providers is scored well in terms of performance, cost and tariff. It was RT 02 KelurahanPasawahan. Provision of clean water at that providers can be replicated by region that will provide a new communal water supply, but the new provider should have special characteristics similar to RT 02 Kelurahan Pasawahan. The characteristics needed are has a resource that can be utilized, has the ability to manage communal water supply technologies, has community participation and has good social capital.

Acknowledgement

This paper is part of Master Thesis on Urban and Regional Planning, SAPPK ITB. A big thank is given to the supervisor, Dr. Ir. HeruHidayatPurboyoPutro, DEA. In addition, thanks are given to Mr. Smith, Mrs. Alit, Mrs. Ike, Mr. Elon, MrNugraha, Mr. Edin, Pak Sutarman, Mr. Edi, Mr. Endang as well as the representation of communal water supply provider that have been willing to give data and information related to this study.
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CONSERVATION UNIVERSITY TOWARDS GREEN INFRASTRUCTURE

Lulut INDRIANINGRUM¹, Teguh PRIHANTO²

Abstract
Semarang State University (UNNES) as part of a larger community has initiated the positive development for the surrounding environment by establishing itself as a conservation university. The university has many potentials resources that can be developed into initial model of Green Infrastructure in university scale. This paper aims to present the supports, burdens and limitations of GI implementation in the university’s area through identifying resources that university have. Supports of the university include natural resources, man-made resources, institution and programs. Burdens and limitations explain the challenge for the university to implement and securing GI as an ongoing commitment and goal. Methodology used are primary observation and documents analysis. The analysis shows that The application of GI in the university is very possible regarding its natural and man-made resource supports as well as institutional and the university programs. Natural Resources supports are through the existence of birds and butterflies in the area of UNNES and some of them are classified as endangered species. The university is located among two kinds of important natural landscapes; there is valley with dense vegetation and river banks with steep cliffs. Those landscapes are potential for GI in UNNES. Man Made resources include water conservation zone, biodiversity conservation facilities and green spaces inside the campus. Supports from institution and programs are abundant because the vision of UNNES as a conservation university. GI in UNNES should include natural landscapes outside the area of campus to make a possible connection to create network required for GI system.

Keywords: Green Infrastructure, Conservation University, Supports, Limitations

Introduction
Green infrastructure (GI) is not a new concept in the development area especially in natural conservation. GI has reached a prominence in discussion and research since late 1900’s around America, UK and Europe. In Asia, the issue of GI is developing more than concern to be a strategy of national development since ADB (Asian Development Bank) pushing GI for Asian megacities in 2012. And in Indonesia, the knowledge of GI is still limited for experts, researchers and has not been implemented as a national strategy. Indonesia should prepare for GI as a need for

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sustainable development and Semarang Municipality in Central Java Province is one of megacity that at risk of climate disaster (Joga, 2010).

The vision of Conservation University is one of the education institution concern and commitment regarding this threat of climate disaster. Conservation University is the vision of Semarang State University (Unnes). It is the first university that declared itself as the Conservation University in Indonesia. This conservation university was declared by Rector of Unnes in a glorious declaration attended by the Minister of National Education of Indonesia on March 12th, 2010. The idea of conservation has become its vision to be an international conservation university which is healthy, outstanding and prosperous. Regarding the vision, Unnes determine to consistently uphold the idea of protection, preservation, utilization and sustainable development of natural and cultural resources of Indonesia. The vision leads to the responsibility to make Unnes as a pioneer of sustainable development within the university itself and to the larger area outside the campus.

In 2012, the university is developing rapidly since the bigger demand of buildings for education and office. In the other hand, reviewing from the geographical side, Unnes is located in mountainous areas with diverse topography. Administratively, Unnes is located in Gunungpati districts of Semarang Municipality. This region is an area that serves as a water catchment area which maintains the hydrological cycle and provides water for the life of the lowland of Semarang. The campus is also surrounded by some types of habitat include: forests, fields, farms, mixed farms and settlements. The potential level of biodiversity of flora and fauna are relatively high. This hilly region is also very likely be exploited and utilized to develop renewable energy sources such as water, wind and sunlight.

Facing the rapid development, the progress of science and technology, and global warming, the existence of conservation areas in the district of Gunungpati should also take into account. The recent development in the campus should be the alarm of bigger concern to secure the ecological resources and conservation vision. These conservation areas are vital to maintain the balance of the ecosystem. The GI as a system of ecology can be developed on a smaller scale inside the campus.

This paper aims to present the supports, burdens and limitations of GI implementation in the university’s area through identifying resources that university have. Supports of the university include natural resources, man-made resources, institution and programs. Burdens and limitations explain the challenge for the university to implement and securing GI as an ongoing commitment and goal.

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3 When it was first established in 1965, it was a Teacher Training College (IKIP). It accommodated the need of teachers around Central Java and gave a great attention to education. Then, by the Indonesian Presidential Decree No. 124 in 1999, IKIP Semarang was converted to be Semarang State University.
Green Infrastructure Concept

The concept of GI is developing depends on the context which it is used. This paper approaches GI from the definition and concept of Benedict and McMahon (2006). Green Infrastructure is an interconnected network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and wildlife (Benedict and McMahon, 2006:1).

Our best concern now is related to grey infrastructure. Unlike our roads, storm water system, schools and other types of public infrastructure, green infrastructure – natural lands and processes – is perceived as an amenity, not as a necessity – a ‘nice to have’ rather than a ‘must have’ (Benedict and McMahon, 2006).

![Image: A Green Infrastructure Network connects ecosystems and landscapes in a system of hubs, links, and sites. Source: Benedict and McMahon, 2006](image)

Although green infrastructure initiatives often begin from greenways efforts, there are some important differences. Green infrastructure differs from greenways in three major ways (Benedict and McMahon, 2006):

- Green infrastructure emphasizes ecology, not recreation
- Green infrastructure includes ecologically important hubs, as well as key landscape linkages
- Green infrastructure can be designed to shape urban form and provide a framework for growth—a framework that pre-identifies ecologically significant lands and suitable development areas.
Conservationists and planners alike recognized that preserving isolated natural areas is not enough—that natural areas need to be connected at the regional and landscape scales to protect biodiversity and ecosystem processes.

Table 1. Differences of Traditional Development and GI Based-Development

<table>
<thead>
<tr>
<th>Traditional Development</th>
<th>Green Infrastructure Based-Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan for grey infrastructure first (roads, stormwater pipes)</td>
<td>First, assess natural features and functions and protect them.</td>
</tr>
<tr>
<td>Green spaces in leftover lands (e.g. steep slopes and floodplains)</td>
<td>Plan for parks, trails, habitat connections before siting buildings.</td>
</tr>
<tr>
<td>Work within confines of parcel – pocket parks, inner trails, gated systems</td>
<td>Connect land and water habitats to region and across ownerships</td>
</tr>
</tbody>
</table>

Source: Green Infrastructure Center, 2009

The following criteria should be considered when determining conservation values (Rattcliffe, 1977; Kendle and Forbes, 1997):
1. Size: Importance to nature conservation increases with size; bigger is better.
2. Diversity: Variety (e.g., range of species and habitats) is better.
3. Naturalness: Less modification is better.
4. Representation: Natural communities that are not well represented in existing protected areas should be priorities.
5. Rarity: Sites that contain rare elements are better.
6. Fragility: Fragile communities are more valuable and deserving of protection.
7. Typicalness: Maintaining good examples of common species is important.
8. Recorded history: Selecting well-researched and documented sites with known presence of species and habitats is better than suppositions.
9. Landscape position: Particularly important in green infrastructure, the contiguity a site maintains with surrounding landscape elements is an important consideration (connectivity of habitat).
10. Potential value: Sites with diminished value but with restoration or enhancement potential are important.
11. Intrinsic appeal: The protection of certain conspicuous species may be appealing to society and may result in a greater overall appreciation for nature conservation.

Analysis: GI Support In The University

Unnes campus is located in the area of 1.245.483 m² which lies around the housing and green spaces in Sekaran Sub District, Gunungpati District (Fig.2). Since Gunungpati serves as water catchment area for Semarang Municipality, the development is restricted by the local government due to this role. This regulation is beneficial for Unnes if GI is implemented in the campus at small scale. Green Infrastructure approach will help the Unnes development plan to secure natural
landscapes and creating man-made landscapes which support the whole system of ecology inside and outside the campus.

Figure 2. Area of Study
Source: Local Government Semarang Municipality, 2012

Figure 3. UNNES Campus in Sekaran
The following describes the existing supports so that GI can be applied in UNNES campus by exploiting existing resources. Such supports are natural resources, man-made resource, institution and programs.

**Natural Resource**

The campus area doesn’t have a natural ecological landscape which stated in the local government regulation as protected. Natural resources in the area of study are classified through the potential existence of fauna. Geographically, Unnes is located at mountainous areas with diverse topography and high levels of biological diversity (biodiversity) of flora and fauna.

Initial inventory of fauna specially birds and butterflies in the campus in 2005, 2008, and early 2009 have identified as many as 58 species of birds. Of these, 14 of them are protected by Indonesian laws and regulations; 2 species included in the CITES protected species category (Conservation on International Trade in Endangered Species of Wild Fauna and Flora) Appendix II, I and a group of protected species including the IUCN (International Union for Conservation of Nature) with the category Endangered Species: EN, and five species including endemic species category of Java. Also found as many as 33 species of butterflies and one of them is a protected species under Indonesian law system (Division of Biodiversity UNNES, 2010).

The existence of these fauna cannot be separated from Mount Ungaran. Unnes is just 10 km from Mount Ungaran and this condition affects the biodiversity in Gunungpati especially in Unnes. The large area of green spaces and lots of trees attract birds, butterflies, and other fauna that makes the campus as potential habitat for certain animal regeneration especially birds.

**Man-Made Resource**

Man-made resources are identified through Unnes facilities which have environment conservation value. The Unnes Conservation Development Agency\(^4\) classified this resource into three categories, water conservation area, biodiversity conservation facilities and green spaces.

a. **Water conservation area**

The area has primary function as a reservoir of rainwater that flows over the ground. The reservoir water can then be used for various purposes. The area (Fig. 4) includes West Reservoir (Area A), Middle Reservoir (Area B) and East land basin (Area C).

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\(^4\) Unnes Conservation Development Agency is one of Unnes agency that has responsibilities to develop conservation values based on 8 pillars of conservation as the basic of the university's development program. The pillars are Green Architecture and Internal Transportation, Biodiversity, Clean Energy, Arts and Culture, Conservation Generation, Paperless Policy, and Waste Treatment.
b. Biodiversity conservation facilities
The facilities are Mahogany Plantation (Area A, D), Campus Mini Forest (Area B, F, G, E), and Educational Garden and Butterfly Sanctuary (Area C).

Figure 4. Water Conservation Area

Figure 5. Biodiversity Conservation Facilities
c. Green and Open Spaces

Green spaces in the area of study are identified through university parks and parking areas (Fig. 6). There are 13 points of green spaces with 10 classified as Green spaces (Area A, D, E, F, G, I, L, K, J, C) and 3 classified as open spaces/parking areas (Area B, H, M).

*Figure 6. Biodiversity Conservation Facilities
Source: Unnes Conservation Development Agency, 2012*

Institution

Unnes has committed to develop conservation value through university’s vision documented in Unnes Strategic Planning 2010-2025. Moreover, the university has establish Unnes Conservation Agency since 2011 which responsible for planning and managing conservation programs. According to these facts, it is clear that the institution supports are abundant. GI is part of conservation value which combines biodiversity conservation and green architecture planning. Green Infrastructure can be implemented in the university with collaborating the experts and resources.

Program

As the support of institution emerged, the planning and programs follow. Programs that support the implementation of GI in the university are as followed:

1. Students Tree Plantation

“One Man Five Trees” is a program required for every new student of Unnes. One student is required to plant and responsible for the growth of five trees
which planted in the campus area. The student must monitor the growth of the plants and input the growth data online start from they enter the university up to their graduation day. The existence of the trees and growth data are two of the graduation requirements.

2. Green Unit Award
   The program provides award to the units of Unnes that have a clean and beautiful environment. This will make every member of the university trying to maintain the clean and shady environment.

3. Internal Transportation System
   Since January 2013, The University has restricted the use of vehicles inside the campus. Parking areas are centered at some parking points, and the people must walk, bicycling, or use the campus bus.

4. Green Architecture Master plan
   Based on the university master plan, Unnes is gradually designing and organizing a better and humane environment. The programs stages from arranging green corridors, designing street furniture, land use identification as a basic for next development, etc.

Those programs have direct correlation to the implementation of GI besides other Unnes programs related to conservation. One of the principles of GI is long term commitment through ongoing programs that will maintain GI in the right track. Unnes has all of the commitment evidence which support GI. There should be some specific programs directly related to plan GI in the university.

**Green Corridor – GI Model**
Based on the identification above, Unnes has specific biodiversity that should be protected because some of those are protected under Indonesian and International law. The university’s corridor can be developed into greenways which support GI in the campus. These greenways should be connected with the man made natural landscape hub to create network.

As Unnes doesn’t have wide natural landscapes, to create a good GI based on the principles of size and landscapes position, we should zoom out the area of Unnes into a wider view. From the Figure.6, we can see that Unnes is surrounded by two kinds of very large natural landscapes. There are valley and river with steep cliff both with dense vegetation. If those sites are connected with Unnes as the connector, it can create a good connectivity.
To create a GI, Unnes should connect the biodiversity conservation facilities and water conservation area (Fig. 3 and Fig. 4) with these natural landscapes. From the GI model above, we can see that Unnes has a big potential in implementing GI inside the campus with networking surrounded landscapes. This network shows a combining of two landscape patches which once separated by the campus.

The analysis shows that the university can play a very significant role for a better ecological system, start from the vision, the institutional setting, programs and GI possibility.

**Limitation Of GI In University**

The term of GI is relatively new in Indonesia. People still confuse between GI, land conservation, green space, etc. People’s perspectives are varied and these make GI so challenging. Ten principles of GI mentions that GI should respect the needs of landowners and other stakeholders as well as connect the activities within and beyond communities (Benedict and McMahon, 2006). In UNNES, knowledge about GI has not been spread evenly among experts involved in the university conservation program. GI application requires an understanding process to stakeholders that the GI is as important as gray infrastructure.
GI should be funded like other critical public investments. The infrastructure funding in UNNES is still based on grey infrastructure. Greenways is still planned separately, they have not been connected as a part of ecological system and still perceived as amenity not necessity. The campus building developments are still leading the priority. There seems to be no action of securing potential landscape to make the greenway system work.

Those weaknesses are not going to make the application of GI becomes impossible. Once the conservation team and program are realizing the importance of GI, the policy to develop GI in the campus will emerge.

**Conclusion**

a) The application of GI in the university is very possible regarding its natural and man-made resource supports as well as institutional and the university programs.

b) Natural Resources supports are through the existence of birds and butterflies in the area of UNNES and some of them are classified as endangered species. The university is located among two kinds of important natural landscapes; there is valley with dense vegetation and river banks with steep cliffs. Those landscapes are potential for GI in UNNES.

c) Man Made resources include water conservation zone, biodiversity conservation facilities and green spaces inside the campus.

d) Supports from institution and programs are abundant because the vision of UNNES as a conservation university.

e) GI in UNNES should include natural landscapes outside the area of campus to make a possible connection to create network required for GI system.

f) GI model shows interconnected network which combines two landscape patches which once separated by the campus.

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FRAMEWORK TO UNDERSTAND THE CONCERNS ON THE BUILDING ENERGY EFFICIENCY (BEE) INVESTMENT IN HONG KONG - A TRANSACTION COSTS (TCS) APPROACH

Queena K. QIAN¹, Abd Ghani Bin KHALID², Steffen LEHMANN³

Abstract
Factors, such as split incentive, information asymmetry, opportunistic behavior, ill-informed users, and institutional transitions, etc., incur different levels of Transaction costs (TCS) and affect the stakeholders' willingness to take part in building energy efficiency (BEE). A better understanding of the nature and structure of TCS is essential to improve the market mechanisms for BEE investment. It covers three dimensions of TCS: specific investment, frequency and uncertainty. The paper provides a framework to understand BEE barriers in general and the TCS concerns of stakeholders in particular. It aims to identify the TCS in practice using a case of Hong Kong in a follow-up study. Real estate developers are chosen to be the study object as they are the initiative and dominate force. In-depth interviews questions are designed to be conducted with executives and architects who represent major real estate development firms in future studies. It focuses on how to smooth BEE transactions and lessen TCS involved. It indicates that TCS are the key factors impeding BEE market penetration, and will provide references to design a governance structure as well as to design policy packages to promote BEE.

Keywords: Transaction costs (TCS), Building Energy Efficiency (BEE), Real estate developer, Hong Kong

1. Introduction

Buildings account for 40% of global energy consumption and nearly one-third of global CO2 emissions (Levine et al., 2007). New buildings that are energy-inefficient are being built every day, and millions of today’s inefficient buildings will remain standing in...
Moreover, the energy usage of buildings is growing rapidly as more people move into modern homes and acquire amenities such as heating, cooling, and refrigeration. Large and attractive opportunities exist to reduce buildings’ energy use at lower costs and higher returns than in other sectors. Compared to developed economies, developing countries in general lack the incentive and technical knowhow to pursue sustainability (Ugwu and Haupt, 2007). There is an urgent call for the developing countries to raise their awareness and contribute their efforts on BEE development so as to combat the climate change and address the environmental concerns (Qian, 2012).

Up to 50 percent of all energy is consumed by buildings, including the development of materials, construction, and operation. In Hong Kong, for example, buildings consume over half of all energy and about 89% of electricity, mainly for air-conditioning, which is the source of roughly 17% of all Hong Kong’s greenhouse gas emissions (CE, 2008; EB, 2008, Chan et al, 2009). In practice, improving BEE is complicated due to the many parties and factors involved: the government, the market, a range of technologies, many practitioners, and a variety of cultures. It would be helpful for governments to know how to oversee BEE development most efficiently. BEE studies, though complicated, are necessary for improving energy efficiency and must involve more than just improving technology. Reports (WBSCD, 2009, Koeppel and Urge-Vorsatz, 2007) show that with currently available technology, the energy-efficiency level could be increased by 30%, yet this does not happen. There must be some underlying reasons that call for the attention of and collaboration among the key players of governing institutions, based on multi-disciplinary studies that consider economics, politics, society, technology, and so forth.

Economic theories suggest that market structure and performance is determined by the ease of entry to and exit from a market (Baumol et al., 1982). Chiang et al. (2001) found that the institutional environment in Hong Kong led to the market concentration of the construction industry. Building contractors compete intensely over cost reductions rather than technology improvements. According to the Hong Kong Consumer Council’s (HKCC, 1996) study, the local property development market was also highly concentrated. It is still true that only the large developers with superior financial resources can remain active in the sector. Under such market situations, the key market players have little incentive to venture into the new business of green building. Compared with conventional building, the entry barrier to the BEE market is higher because of the new information, expertise, new technology, and financial risk involved. If there is asymmetric information about quality standards or mandatory requirements that are not imposed on the market, the opportunistic behavior of most market players may make them continue to produce conventional buildings (Akerlof 1970).

From the new institutional economics perspective, when transaction costs (TCs) are too large, they inhibit exchange, production, and economic growth. The functioning of TCs
under alternative institutional arrangements is also crucial to the workings of markets (Cheung, 1998; Coase, 1998; Benham & Benham, 1997; North, 1990, 1991). From the perspective of transaction cost economics, energy efficiency is a coordination and incentive problem rather than one of utility maximization (Levine, et al, 1995). This view also emphasizes that policy interventions and different institutional structures may lower TCs and provide net social benefits (Golove and Eto, 1996; Levine et al., 1995; Koeppeland Urge-Vorsatz, 2007). The situation calls for a thorough study focusing on how to smooth transactions for market stakeholders in energy-efficient development, with the aim of lessening the TCs involved in BEE transactions.

Figure 1 illustrates the key issues of this research for which a critical review of the literature is provided to develop a clear understanding of how they relate to one another. The consolidated issues are summarized to help develop the research questions and propositions.

**Figure 1. Five Key Research Subjects and Their Interrelations (Qian 2012)**

This research mainly focuses on how to smooth transactions among the market stakeholders in energy efficiency development in order to realize the energy-saving target. The study does not focus on any particular type of building technology, but rather on how to marketize energy-efficient buildings to be more acceptable to market stakeholders and to lessen the TCs involved by understanding the barriers to BEE and creating policy packages to encourage such investment. It thus intends to identify key areas where policy initiatives can help address the market’s needs for BEE by empirical study.
2. Literature review

2.1. TCs approach

“Without the concept of transaction costs, which is largely absent from current economic theory, it is my contention that it is impossible to understand the working of the economic system, to analyze many of its problems in a useful way, or to have a basis for determining policy.” (Ronald Coase, 1988)

Transaction costs, in Coase’s (1937, 1961) original formulation, refer to “the cost of using the price mechanism” or “the cost of carrying out a transaction by means of an exchange on the open market”. In Demsetz’s study (1968), “Transaction cost may be defined as the cost of exchanging ownership titles”. Gordon (1994) consolidated definition of transaction cost as the expense of organizing and participating in a market or implementing a government policy is the definition used in this study. A number of transaction-cost issues arise with respect to the development and implementation of BEE incentive schemes. Adapting this definition is in line with the work of other authors who treat TCs and administrative costs as essentially interchangeable terms (McCann et al., 2005). AsCoase (1961) explains, “In order to carry out a market transaction, it is necessary to discover who it is that one wishes to deal with, to inform people that one wishes to deal and on what terms, to conduct negotiations leading up to a bargain, to draw up the contract, to undertake the inspection needed to make sure that the terms of the contract are being observed, and so on.” Thus, there is reason to consider changing institutions, formal and informal rules and their enforcement arrangements, to the extent that these influence the nature of transactions and thus their costs.

Transaction cost economics (TCE) argues that markets and organizations provide alternative means of organizing economic activities and that the choice between them depends upon a number of factors, including the relative magnitude of TCs(Williamson, 1979, 1985). In common with orthodox economic theory, TCE explains the behavior of individuals rather than social structures and assumes these individuals to be rational actors in that they seek out opportunities to improve economic efficiency. This research applies TCE to study the underlying reasons why the market is reluctant to accept BEE by choice. The findings help establish the study’s later discussion on how to choose a particular governance structure to solve the existing problem.

In empirical studies, a direct measurement of TCs is simply the economic value of resources used in locating trading partners and executing transactions. Another common measurement of TCs is the difference between the prices paid by the buyers and received by the sellers. Some studies focus more on secondary costs than on direct costs per se. For example, Williamsonian TCE is primarily interested in the secondary costs of
negotiation and enforcement. Some are concerned with the cost of government regulations imposed on market entry and transactions, which either reduces the size of the market or eliminates the market altogether. In this study, the key TCA independent variables for measuring the preference of developers’ for BEE investment are asset specificity (or specific investment), uncertainty (economic, market and policy uncertainty), and frequency. Asset specificity refers to durable investments that are undertaken in support of particular transactions. These specific investments represent sunk costs that have a much lower value outside of these particular transactions (Williamson, 1985). Uncertainty refers to three aspects: economic uncertainty, market uncertainty and policy uncertainty. Frequency refers to how often the buyers make purchases in the market (Williamson, 1985). Figure 2 is a TCA Model developed for this study to help understand developers’ preferences for BEE investment with the consideration of transaction costs. Three measurement indicators for TC items in this study are money, time, and worry. Propositions will be developed, and a set of interviews will be conducted with real estate developers and their representatives to determine the importance of TCs.

Figure 2. TCA model for real estate developers’ preference on BEE investment (by the authors)

2.2. BEE and its barriers

With socioeconomic progress, more market stakeholders are getting involved in the building sector and are dedicated to their own business interests. Real estate developers intend to do no more than obey the basic requirements of the law and regulatory policies to minimize the increasing costs engendered by the extra work entailed by mandatory energy regulations. Contractors also want to avoid these extra tasks, because they require special expertise and specialized equipment that they do not typically possess.
Manufacturers of BEE products want regulations to be still stricter to create greater demand. Building-design institutes will not be greatly influenced by the new policies but are apt to succumb to the demands of developers because of the nature of their relationship with them. However, these interests have not yet been fully expressed by the stakeholders themselves, because most of them are still learning about how to participate in policy making. These conflicting interests are the main source of the risks of and barriers to BEE development.

The number of barriers is enormous – according to some estimates, they are higher in the building sector than in any other sectors (IPCC, 2007, Koeppel and Urge-Vorsatz, 2007). In this context, a barrier refers to a mechanism that inhibits decisions or behavior that appear to be both energy efficient and economically effective. In particular, barriers are claimed to prevent investment in cost-effective energy-efficient technologies (Sorrell et al., 2004). The terms “barrier” and “market barrier” were introduced by researchers using engineering-economic models to study the technical and economic potential for energy efficiency. The observation that there was often little interest in investments with very high rates of return led researchers to postulate that such investments were inhibited by various barriers and that this justified public intervention. This study has developed a framework for analyzing BEE barriers and TCs incurred based on Harris and Carmen (1983), Koomey (1990), Jaff and Stavins (1994) and Sorrell et al. (2004)’s earlier work. The interview questions in the empirical study are designed based on this framework.

![Figure 3. Framework for reviewing BEE market (Qian 2012)](image-url)
2.3. Barriers relating to the BEE market (developers and end-users) and government’s role

This study focuses on two main market players involved with energy efficient buildings – the real estate developers and the end-users, who are at the two ends of the delivery of energy-efficient buildings. It makes sense to believe that these two players are so interrelated in the market that any concerns that hinder them from investing in BEE will eventually keep the transaction from happening. Therefore, this part of the analysis is to determine how their interactions affect their willingness to do business.

Promoting BEE requires that government and all parties in the market work together. By and large, the government agencies concerned with energy efficiency end up confining themselves to providing publicity and information. The government needs to play the role of a moderator who makes it convenient for the market to embrace BEE. The growth of the BEE market requires a politically friendly environment with the appropriate combination of government intervention and flexibility; it also needs a well-designed institutional structure to encourage investment and change the business culture. The government’s role is mainly to set out a good foundation (the well-organized institution) and a clear domain (clear of constraints, but also some flexibility) for the BEE market stakeholders.

2.4. The hypotheses and the interview questions from BEE barriers - an overview

Design of the interview question was based on the discussions on BEE barriers, to address three major theoretical dimensions of transaction costs: specific investment, frequency, and uncertainty. Seven hypotheses regarding these three aspects were developed, and related open questions about the interviewees’ opinions were designed to test each of them (See Table 1). Table 1 summarizes the barriers discussed in literature that the authors take reference to develop the hypotheses for empirical interviews of this study. The hypotheses and the interview questions were developed based on the literature review and discussions with a few experts in industry and academia. The relations between the three dimensions, seven hypotheses (H), and fifteen interview questions (Q) are listed in Tables 2-4 below. The Remarks explain how the interview questions relate to the hypotheses. The purpose of these interviews is by using an in-depth local case study from the developers’ viewpoint to ascertain the concerns and TCs in practice that may affect the decision-making of the real estate developers.
### Table 1. Barriers to BEE and Their TCs Considerations to Develop the Hypotheses for Empirical Interviews


<table>
<thead>
<tr>
<th>Barriers</th>
<th>Common Claims</th>
<th>BEE TCs considerations- developed to Hypotheses</th>
</tr>
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</table>
| Risk aversion                 | ▪ BEE investment represents a higher technical or financial risk. The business & market uncertainty encourages short time capital return.  
▪ To replace familiar technologies and partnerships with new but more efficient ones is difficult due to risks, including economic fluctuations, policy instability, possible delay, and litigation, which should average out across the entire society and yield a positive economic return. | **Specific investment:**  
**H1:** Dividing the transactions of the real estate development process into smaller established stages helps government to better understand the process and make policies with a more focused emphasis on the different stages of transaction to promote BEE more efficiently.  
**Frequency:**  
**H2:** There is a positive relationship between the size of the company and the TCs in BEE projects.  
**H3:** There is a positive relationship between the frequency of BEE investments and the TCs incurred in developing BEE projects.  
**Uncertainty- economic**  
**H4:** The economic context (upturn or downturn economic transition) affects the concerns of the real estate developers about BEE investment.  
**H5:** Changes in economic conditions call for the attention of government to adjust BEE policies as necessary to seize BEE development opportunities.  
**Uncertainty- market**  |
| Hidden costs and benefit      | ▪ BEE potential may be overestimated by failing to account for the reduction in utility associated with BEE technologies and other additional costs.  
▪ The hidden costs and benefits are not captured directly in financial flows, including costs associated with securing the energy efficient solution and risks associated with the replacement technology. TCs are often high due to the fragmented structure of the building sector with its many small owners and agents. New technologies may not be compatible with existing sockets. The indirect benefits of improved energy efficiency, such as reduced air pollution and improved health, are often ignored. |                                                                                                               |
| Imperfect information         | ▪ Lack of information about the possibilities and techniques for and potential of energy-efficient solutions is a major barrier, especially in developing countries. TCs of information acquisition may be high due to quality and credibility. |                                                                                                               |
| Negative externality          | ▪ Non-BEE buildings consume more energy and release more carbon emissions, which are the negative externalities and need to be taken into account and be fairly apportioned to keep the end-users and developers from losing the motivation to further invest in BEE. |                                                                                                               |
| Access to capital             | ▪ BEE investments may be avoided if market stakeholders have insufficient capital through internal funds, and has difficulty in raising additional funds, due to internal capital budgeting procedures, investment appraisal rules and the short-term/instable incentives.  
▪ Higher capital costs raise the uncertainty and opportunity costs to the stakeholders, especially if the investment is financed by a mortgage or other loan. Besides, BEE investment would normally require a longer payback period, which increases business risk. |                                                                                                               |
<p>| Public goods                  | ▪ BEE would prevent society from consuming extra energy and releasing unnecessary pollution, and have a collective effect society as a whole would benefit from, and many would benefit as free riders. BEE itself creates a lack of interest in itself as a business initiative. The availability of BEE information is also a public good. The public requires a large flow of extra information to have confidence in breaking its routine to invest in BEE. Market stakeholders need to have public and transparent information about technology. |                                                                                                               |
| Bounded                       | ▪ Owing to constraints on time, cost, and the ability to process information, imitated knowledge of the stakeholders on BEE investment, they either have an irrationally high expectation for the BEE investment |                                                                                                               |</p>
<table>
<thead>
<tr>
<th>Rationality</th>
<th>return and/or payback period, or more interested in pursuing other short-term alternatives or to neglect the small cost savings from the energy efficiency improvement.</th>
<th>H6: The end-users’ variable expectations about BEE increase market uncertainty to the developers (e.g., they may misinterpret a focused group as the end-users of their final products.)</th>
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<tr>
<td></td>
<td>Changing behavior or lifestyles is very difficult. A lack of awareness and information about the opportunities and low costs of energy savings are a related problem. Energy subsidies are considered to be one of the most important BEE barriers in developing countries.</td>
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<tr>
<td>Split incentives</td>
<td>The cost and benefit of BEE is bear by different parties and difficult to appropriate among the investors. Examples are the tenants who pay for energy are likely to be interested in reducing its use, but have no control over the system, whereas the building owners are not interested in improving energy efficiency. The developers are reluctant to invest unless someone is going to pay for it. Similarly, utilities have no direct interest in measures for reducing their clients’ energy use.</td>
<td>H6: The end-users’ variable expectations about BEE increase market uncertainty to the developers (e.g., they may misinterpret a focused group as the end-users of their final products.)</td>
</tr>
<tr>
<td>Regulatory distortions</td>
<td>The regulatory structure can create perverse incentives in form of regulatory bias, under-priced energy, building codes, and subsidies to established energy technologies. The building codes are not updated in a timely fashion, which inhibits technology innovation and interferes with efficient construction; inconsistency confuses the market and creates obstacles to achieve economies-of-scale for BEE.</td>
<td>Uncertainty-policy</td>
</tr>
<tr>
<td>Political and Organizational barriers</td>
<td>A lack of government involvement in promoting BEE due to inadequate enforcement structures and institutions; inappropriate government intervention that distorts business activities; the inflexibility of local governments; an insufficient number of qualified personnel; the lack of a long-term energy conservation mechanism; a lack of credible third-party agencies; the slow pace of institutional reform; worries about social stability; policies or programs that are incompatible with one another; resistance from interested parties; legal &amp; urban-planning constraints; weak investment culture; weak managerial supervision of manpower &amp; organization; problems with multi-institutional collaboration &amp; coordination; local governments’ resistance to change; and corruption.</td>
<td>H7: The earlier the stage of BEE policy implementation, the greater the real estate developers’ concern about transaction costs.</td>
</tr>
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3. Design of the interview questions from the hypotheses- in details

3.1. Questions for Specific Investment

Specific investment in BEE increases the workloads of developers and the resources they need, which increases their concerns as they decide whether to make a BEE investment.

Table 2 Specific Investment – relating to H1

| Q1   | What are the reasons that make developers willing to invest in new BEE technology without government incentives? What price difference (% of development cost) would be acceptable? |
| Q2   | Uneven emphasis on incentives: What facilities/building elements are more expensive/difficult to be retrofitted, if not installed in the first place? Should they be emphasized in incentives to promote BEE investment? |
| Q3   | For developers investing in BEE, what are the different concerns of investing in luxury buildings and in lower-priced buildings? Why? |
| Q4   | There is misplaced benefit between the people who pay and who gain from BEE. To address this problem, would rental/selling-price differences help? |

Hypothesis (H1) proposes that in securing a detailed understanding of the BEE elements, such as technologies, appliances, or inputs for specific investments, it is better to break down the real estate development process, by the difficulty of retrofits (Q2), by the type of buildings (luxury or low-price), (Q3). The purpose of these questions is to determine whether the policies can be designed for a highly specific group with effective incentives for securing investments in BEE.

Q1 is to elicit the underlying reasons and the approximate limit (as percentage of the development budget) that the developers would be willing to invest in BEE without incentives from the government. The purpose is to see if the government could create a business environment conducive to BEE with any market interventions. Q4 addresses one of the most notorious features of BEE – misplaced interests – in order to understand how they affect the current situation, determine what about them concerns developers, and determine what, if any, resolution is called for by the market. These five interview questions collectively address, from different perspectives, the issues raised by Hypothesis H1. The open question format allows the interviewees to talk freely about their concerns in a wider context.

3.2. Questions for Frequency of BEE investment

The frequency of BEE transactions is another dimension that affects transaction costs. How frequently the developers invest in BEE may affect their concerns differently. The TCs may thus change accordingly (H3).
Q5 Will the size of the project affect the developers’ concerns about BEE investment?

Q6 Will the size of the RED company affect the developers’ concern about BEE investment?

Q7 How does the frequency (e.g., regular, occasional, or at one-time) of developers’ BEE investments affect their concerns about BEE investment?

Q8 Would the developers’ concerns change if they invested in BEE projects more frequently? Why?

Q7 and Q8 are the two questions that address the relationship between the level of concerns about BEE investment and the frequency of BEE transactions. The nature of this relationship may help governments design different policies to encourage investment by frequent and occasional investors by taking into account their different concerns.

The size of the company and the size of the project also affect investors’ capacity to invest and, therefore, the frequency with which they do so (H2). Big companies may have different concerns and strategies than smaller ones when it comes to BEE investments (Q6). To integrate green features into bigger projects may have different impacts in terms of transaction costs, compared to smaller ones (Q5).

To understand how changing concerns are a function of the size of the RED company or project and the frequency of BEE investment requires knowing market segmentation according to both size and frequency. This information allows government to design and specify incentives for more focused groups.

3.3. Questions for Uncertainty

Uncertainty about BEE investments is one of the general features of TCs that causes real estate developers worry. Uncertainty is examined in this study from three perspectives: economic uncertainty, market uncertainty, and policy uncertainty.

Table 4 Uncertainty: relating to H4-H7

<table>
<thead>
<tr>
<th>Economic uncertainty</th>
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<tr>
<td><strong>Q9</strong></td>
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<td><strong>Q10</strong></td>
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<td><strong>Q11</strong></td>
</tr>
</tbody>
</table>
What is the impact of economic transition on the BEE development (to the developer – H4; to the government – H5)? Is it a challenge or an opportunity? How do the developers’ concerns change in an economic downturn or upturn? What should government be alert to during such periods and how can it develop the most effective policies to promote BEE accordingly? These are the main issues that are addressed in interview questions Q9–Q12.

The market also creates many uncertainties for developers. They may be hesitant to invest in BEE due to a lack of confidence in estimations of market demand. The end-users’ expectations and concerns about BEE may be better known, so that both the developers and the government could seize the opportunity to promote BEE. This brings H6 onto the horizon. Q13 and Q14 are designed to detail the behavior and concerns of the market end-users about BEE by segmenting the customers so that the real estate developers might have a more confident business strategy and so that the government can design its incentive policies to cater to more focused groups based on a better understanding of the needs and concerns of both end-users and developers.

Policy also affects uncertainty during different implementation stages. This uncertainty affects the worries and enthusiasm of the market variously, thus affecting the effectiveness of the policies themselves. The policy uncertainty is based on the assumption that the timing of the policy’s introduction is a major factor in causing uncertainty for the real estate developers (H7). Q15 is designed to elicit information about how the stage at which the policy is implemented affects the real estate developer’s concerns, which gives government information that lets it have market concerns in mind as it implements policy at different points in the process.

<p>| | |</p>
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<tr>
<td>Q12</td>
<td>What BEE promotions or incentive could government introduce in times of economic change that would be less upsetting to the market players’ normal activities?</td>
</tr>
<tr>
<td><strong>Market uncertainty</strong></td>
<td></td>
</tr>
<tr>
<td>Q13</td>
<td>Occupants’ behavioral differences may lead developers to produce different BEE/GB at different performance levels. What is your view?</td>
</tr>
<tr>
<td>Q14</td>
<td>Will concerns about social classes (different education levels, experiences, financial ability to enjoy the benefits of BEE) affect the developers’ concern about BEE investment?</td>
</tr>
<tr>
<td><strong>Policy uncertainty</strong></td>
<td></td>
</tr>
<tr>
<td>Q15</td>
<td>Would a new incentive and a currently mature incentive affect the developers’ concerns about BEE differently? In other words, encountering BEE incentives, would the developers have more concerns during the early or later stage of the implementation of the incentive? How are they different?</td>
</tr>
</tbody>
</table>
4. Discussions on the role and the partnership of government and business in promoting BEE

As an authority to set up institutions and design policies, government is more able to improve its own efficiency and internal decision-making than to improve its external counterpart, the market. Government should adopt a clear national policy to improve energy efficiency through a coherent package of policy measures. Policy mechanisms alone will not work and market forces by themselves will not achieve the potential for energy efficiency. Because the spread of energy efficiency improvements cannot be left to the market, there has to be an emphasis on policy-assisted, market-oriented mechanisms for promoting energy efficiency.

To determine the most needed policies to improve BEE in a particular society requires an in-depth understanding of the expectations of the market and government. Most policymakers regard energy efficiency principally as an environmental or social issue, rather than an economic one. Hence, policies are designed with inadequate consideration of the needs of market stakeholders and not pay enough attention to the necessity that businesses accept them. Government tends to pay more attention to the environmental consequences of energy consumption, and business enterprises may care more about their technical and financial ability to make changes, their potential economic benefits, and so forth. Detailed negotiation and greater understanding between government and the market stakeholders is needed to reach a win-win outcome.

Only when both the end-users and the developers appreciate the benefits of energy efficiency building will they create a business channel for BEE products and the BEE market. Policies have to be devised to protect the poor, the environment, and the future. Each of the barriers discussed above provides an opportunity for policies to address, but it will involve simple matches of one policy to one barrier. It will require a careful selection and combination of a set of policy instruments to overcome these existing barriers. How, then, do we choose among so many policy instruments? Economic theory, along with careful analysis of BEE barriers, provides guidance for matching policies to barriers.

5. Follow-up studies: empirical research on BEE to be conducted in Hong Kong

5.1. Why is Hong Kong chosen as a case study?

Hong Kong is a suitable choice for this study, as it is economically well-developed regions with free markets and fairly educated professionals for green building and energy efficiency. The GDP per capita at current market prices in 2007 in Hong Kong was U.S. $41,110 (IMD World Competitiveness Yearbook, 2007). Construction as a share of total GDP has been in the range of 5-7% in Hong Kong in recent years (Raftery et al., 2004). Harnessing solar energy through solar cells, sun-
shading devices, low-emissivity glass, energy-efficient air-conditioning systems, and building-space planning and orientation are common design considerations for BEE in Hong Kong. Hong Kong relies more on voluntary effort, and there are several green groups, such as the Professional Green Building Council and the Green Council, promoting the voluntary use of BEE. The HK-Beam and other green-label programs are accepted assessment tools promulgated by voluntary bodies in the past decade. In recent years, the Hong Kong government has begun to take an active part in driving BEE initiatives (Chan, 2000; Chan and Lau, 2005).

5.2. Why in-depth interview the real estate developers?

In-depth interviews were conducted with the executives and architects who work in big real estate development firms in Hong Kong to solicit their views on issues regarding BEE investment. The interviewees to be selected are top managers or directors from the top 6 real estate development companies, who actively worked in major real estate development firms or architectural firms, which covered 80% of real estate activities in Hong Kong. As the decision-makings and strategic plans for the real estate development- whether BEE or not, and market expectations/ concerns to BEE, are only done by people who are senior and stay high position. Their views and opinions reflect their preference to current BEE development in practice, which directly and indirectly reflect their will if and how to achieve the BEE decision-makings, and have a very heavy weight to influence the other stakeholders in the BEE market and affect the development of BEE market. Therefore, the findings of the interviews serve the research purpose and have its significance. The purpose was to get the perspectives of real estate developers and to check the assumptions and findings about BEE market barriers in the literature review. It thus will provide a reference for designing rational policy.

6. Conclusions

This study develops a methodology framework of the TC theories to be tested in the real world interviews in future case study of Hong Kong. This study has adopted a holistic approach to studying the barriers to BEE investments and has focused on TCs in particular. It provides a review of diverse literatures, including those on building energy efficiency, transaction costs, and real estate development. This research has comprehensively analyzed the market barriers to BEE and TCs incurred from the perspectives of the developers. The overall methodology framework is theoretically significant with the original data from a case study in Hong Kong to bring a thorough understanding of BEE market. The results will definitely help understand the real market concerns in terms of TCs regarding BEE development. It helps the policy makers to understand when, to whom, where, and how to design the policies that are in favor to the real need of the market. It, therefore, ensures the success of BEE implementation.
Acknowledgement

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LOCAL GOVERNMENT SPENDING ON INFRASTRUCTURE: THE ROLE OF INTERGOVERNMENTAL FISCAL TRANSFERS

Adiwan ARITENANG

Abstract
The infrastructure availability, both quality and quantity, is considered far from adequate with low accessible rate. The political regime shift in decentralisation implemented in the late 1990s has provided the local governments to determine local development goals and through the fiscal decentralisation. With more than 400 districts, there is a wide variation on infrastructure policies and the proportion of funding among local governments performance on infrastructure development. This paper aims to examine the impact of local endowments and intergovernmental grants on districts’ capital spending. Comparisons of model simulations suggest that the role of intergovernmental fiscal transfers have lower impact on infrastructure per se, than with overall general spending. The paper argues that the stagnated grant funding at low levels and local economic structure hinders a more balance regional economic growth in Indonesia. Furthermore, the paper shows limited affect of local institutions suggesting infrastructure development is largely neglected by local governments.

Keywords: Fiscal decentralization, Infrastructure, Regional Growth, Econometrics, GMM

1. Introduction

The fall of New Order regime in 1998 was followed by a politico-economy shift in Indonesia with the implementation of decentralisation. The new regime had two pillars, the law 22/1999 and the law 25/1999. The law 22/1999 contains the administration of decentralisation arrangement between the central and regional governments and law 25/1999 regulates fiscal decentralisation of intergovernmental transfers and revenue sharing.

This study departs from the debate of mechanisms which interplays the impact of fiscal decentralisation to either increase of decrease inter-regional differences. Similar studies on the impact of fiscal decentralisation to regional convergence are mainly at the state level (Rodríguez-Pose and Bwire, 2004; Rodríguez-Pose and Gill, 2005; Aritenang, 2008, 2012; Calamai, 2009; Rodríguez-Pose and Ezcurra, 2011) or on other countries (Lin and Liu, 2000; Canaleta, et al, 2004; Silva, 2005; Fan and Sun, 2008). There are few studies such as Akita and Lukman (1995), Resosudarmo & Vidyattama (2006) but these studies concerns with the provincial level. However, as Indonesia study is at the district level, the previous studies could only act as a

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general overview on the research, and should not be considered to capture the dynamic at the districts.

This paper aims to examine the impact of local endowments and intergovernmental grants on districts ‘capital spending. To do so, this paper follows previous studies that explore this effect using the statistics data and econometrics analysis methods. The paper is organized as follows. Section 2 we discuss theories on decentralisation and fiscal arrangement in Indonesia. In section 3 elaborates research methods and econometrics analysis. Section 4 presents and analyzes the results. Finally, section 5 concludes the paper findings and policy implication.

2. Decentralisation: Theory and Implementation

The efficiency of resources allocation is regarded as the key for development. In the public sector development, Musgrave (1959) argues three main objectives: efficiency in allocation of resources, income distribution, and macroeconomic stability. While Canaleta et al (2004) views that the first objective can be address through decentralisation, the latter two could only be performed by central government. The efficiency has been a long support of decentralisation as the arguments are mainly based on augmented economic efficiency (Calamai, 2009). There has been evidence that devolution brought citizen participation in of planning progress and decision-making.

Devolution also enables innovative regional policies that respond market demands to attract investments and talented people (Pepinsky and Wiharja, 2011). However, this depends on the assumption that regions are sufficiently similar size and development orientation. Furthermore, there should also support from the necessary local capacities and institutions (Calamai, 2009). Specifically, the capabilities to draft policies are influenced by socio-political issues such as local embedded and bounded institutions that influence innovation (Hall and Taylor, 1996; Thelen, 2004).

Literatures on decentralisation mainly focus on the actors’ demands and neglect the supply side. The supply side concerns the quality and skills of local government officers with limited skill and managerial ability (Prud’homme, 1995). In the centralise regime, the central government has better institutional capacities with greater salaries, experience and more efficient administration, which is in contrast with the regions' capacities. Furthermore, central government officers have higher human capital through better education level and on-job-training compared the local officers. In decentralisation, the institutional capacities influence the development mechanism that increases regional disparities (Rodríguez-Pose and Gill, 2005). While in decentralisation, regional development are operate by local officers with low education level and inadequate national policy knowledge hinders optimum public services at the local level.

2.1. Fiscal Decentralisation

Fiscal decentralisation is considered as a tool to achieve efficient resources allocation and promote development objectives. Furthermore, fiscal decentralisation is considered to ‘escape the traps of inefficient governance, macroeconomic instability,
and inadequate economic growth in which they have become mired in recent years (Seymour and Turner, 2002).

Fiscal devolution has two impacts on regional disparities, financial and non-financial. In the financial impact, the difference in tax policies and welfare regulations will differ with the region’s economic performance. The autonomy allows regions to customise taxes and welfare policies based on its development objectives, such as tax holidays, tax targets, and other financial policies. Different region sizes and regulations cause regions to earn revenue variation due to larger economic activities and taxed workers.

Thus, decentralisation influences the region’s capacity to generate own source revenue. In the short run, the transfer of power to tax will benefit regions with a more developed economic through greater tax base (Rodríguez-Pose and Ezcurra, 2010). Thus, this becomes incentive for regions to compete and deliver higher economic growth. This incentive is seen greater for lagging regions as they have more need for development by fiscal competition and flexible labor markets. However, considering its impact, Lin and Liu (2000) argues that the fiscal transfers improve efficiency of resources allocation rather than promoting institutions.

This brings to the first non-financial impact of fiscal decentralisation, in Indonesia, tax revenue and expenditure are restricted and controlled by the central government (Calamai, 2009, pp. 1130). The reluctance of central government seems to devolved larger tax revenue authority to the regions leads to inadequate or unfunded responsibilities of certain expenditures (Rodríguez-Pose et al, 2009, p.2044; Rodríguez-Pose and Ezcurra, 2011). This reduces the degree of regional governments to adjust spending on local preferences and compromise policies and services. In this sense, regions have to find their own revenue sources through taxes, decrease spending per capita, or increase efficiency (Rodríguez-Pose and Gill, 2005, p. 414). They will have to rely on more levies and compulsory appropriation to fund their limited economic growth potential (Rodríguez-Pose and Ezcurra, 2010, pp. 625). This imposition of new charges, levies, or fees becomes a tool for local governments to generate more income and ensure cash flow (Brodjonegoro, 2009, p. 207). As a result, this hurts local investment climate and hinders competitive edge. This concerns over how poorer regions will challenge richer regions on attracting investments with their deficient infrastructure endowments and inadequate institution for revenue administration (Oates, 1993; Rodríguez-Pose et al, 2008). Another non-financial impact is that rich regions gain political power through significant contribution to intergovernmental transfers (Rodriguez-Pose and Gill, 2004). This situation represents factual divergence where rich regions have more voice and influence in central government policies.

There is a large body of literature and studies on devolution impact to regional convergence (Barro, 1990, 1991; Rey and Montouri, 1999; Rodríguez-Pose and Ezcurra, 2010, 2011). The fiscal devolution is usually approximated by sub national expenditure as a percentage of total government expenditure. The fiscal decentralisation could also be approximated with sub national sum of funds generated locally and transferred from the central government.
2.2. Indonesia Fiscal Decentralisation

According to the decentralisation Law 22/1999, decentralisation at the provincial level is in the de-concentration and devolution form, on the other hand, municipality/regency and village operates in the devolution form. While provincial decentralisation is considered as “the extended arm” of Central government, municipalities/regencies administration are in complete control of their region. In other words, provincial government are both de-concentration and devolution, while municipality/regency governments are in devolution form.

In Indonesia, decentralisation is formed in three levels, provincial, municipality/regency, and village. Municipality and regency are at the same government administration level, a level between the provincial government and village administrator. The difference between the two is that municipality are dominated with urban activities such as manufacturing, trade, service, and hospitality, meanwhile regency economic activities are driven by more rural-based sectors, such as agriculture and agro-business (Nurcholis, 2005).

Following the literature, the general allocation fund (dana alokasi umum/DAU) as a block grant for regional development is crucial to balance this revenue gap among regions. This requires a strong system of redistribution of intergovernmental transfer fund and strong regulatory systems, which in the absence of this requirement will only increase disparities and growth divergence. This confirms that a strong central government role is crucial in the devolution era. Strong central government decision-making is important to minimise the effect of competition and fiscal capacity. The central government is also important to mediate welfare costs that ensure zero-sum competition, fosters access to capital market and reduce tax bases for less advantaged regions (Rodriguez-Pose and Gill, 2004).

In Indonesia, the importance of central government is illustrated clearly in the role fiscal decentralisation in Indonesia with five main goals: (i) to decrease fiscal imbalances between the national and regional government (vertical imbalances) and between regions (horizontal imbalances); (ii) to improve public services; (iii) to enhance national resources’ exploitation efficiency; (iv) to improve governance, transparency and accountability in fiscal transfers to regions; and (v) support fiscal in macroeconomic policies. Furthermore, fiscal decentralisation extends the power to raise local taxes and promote local finance management accountability to regions. Thus, this explains the limited taxing authority of the regional governments. Presently, the development budget sources are as follows:

1. Local revenue consist of tax, levies, and regional owned enterprises revenue
2. Transfer budget: property tax, natural resources revenue sharing, General and special allocation fund, and regional borrowing.
3. Data and Methodology

This paper uses the Statistics Central Bureau (Badan Pusat Statistics/BPS) districts list publish in 1997 with 292 districts in 26 provinces\(^2\). This data manipulation allows the research to avoid analysis bias due to regional splitting that occurs since the decentralisation. All variables are in the log format for the period between 1993 and 2006.

To investigate the impact of decentralisation on regional economic convergence, this paper employs two data sources. First, the fiscal data and expenditure of district governments is obtained publicly from the Ministry of Finance (MOF) website\(^3\). The fiscal and financial data are in Indonesian Rupiah currency. Second, the gross regional domestic product (GRDP) and population is obtained from an unpublished BPS data, exclusively acquired for this research.

Methodology

The contemporary convergence theory was developed by Barro and Sala-I-Martin (2004) that introduce the absolute and conditional convergence. The absolute convergence occurs when the growth model parameters are equal and conditional convergence relates with the movement of steady state growth of the exogenous factors (technology, population growth, and savings) in constant per capita income or consumption level and capital per labour ratios between regions. This is conditional because the external factors are different across regions. The $\beta$ convergence occurs if the distribution of growth rate falls over time (Pike et al, 2006). The $\beta$ convergence studies found that regional convergence speed varies following economic cycle, it peaked during recession and plunge during economic booming (Barro and Sala-I-Martin, 2004).

If negative relationship occurs, then it can be explain that poor regions experience faster growth than rich economic regions and hence, there is convergence over time within the country (Barro et al, 1995). The basic equation for a region i with annual data that are available for per capita income is approximated by:

\[
\ln(Y_{it}) = a + (1 - b)\ln(Y_{it-1}) + e_i
\]

Dependent variable is the $Y_{it}$, the GDP per capita growth, as the net log of per capita income, a and b are constant, with $0 < b < 1$ and $e_i$ is the disturbance term. The term $a > 0$ refers that $\beta$ convergence because annual rate is inversely related to $(Y_{it-1})$ and higher value of $\beta$ shows higher degree of convergence. Theoretically, $\sigma$ convergence is a necessary condition for $\beta$ convergence to exist, but it is not sufficient to ensure the occurrence of $\beta$ convergence. This is because it may rise of fall towards steady state depending on the initial value.

First, the panel fixed-effect (FE) is as suggested by Resosudarmo and Vidyattama (2006). The regression in equation (2) is the conditional convergence analysis with i

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\(^2\) Available from the Statistics Central Bureau (Badan Pusat Statistics/BPS), www.bps.go.id
\(^3\) www.djpk.go.id
denotes the individual district, \( t \) is the index of time, \( y_{it} \) is GRDP per capita, the \( F_{it} \), \( S_{it} \) \( L_{it} \) is the vector of intergovernmental fiscal, proportional revenue, and local revenue variables, respectively. The model needs the individual effect, \( \eta_i \) to capture all the determinants of growth for various regions in panel data analysis. The \( u_{it} \) is the random disturbance not to be correlated when the time or region is not the same and assume \( u_{it} \) is constant.

This paper main contribution is using a dynamic panel data (DPD) model and systems generalised method of moments (GMM) estimation to overcome the issue of endogeneity and multicollinearity with the relationship between the variables. The basic model of GMM estimation is shown in equation (3).

\[
\text{InfastExp} = \sum_{j=1}^{2} \alpha_j \text{InfastExp}_{i,j-t} + \beta_1 \text{OSR}_{i,t} + \beta_2 \text{IGT}_{i,t} + \beta_3 Z_{i,t} + \nu_i + \epsilon_{it}
\]

(3)

Where subscripts \( i \) and \( t \) represent individual local governments and year, and the dependent variable is the district governments expenditure on infrastructure. Second, the owned-source revenues of each district variable that consists of tax and levies. Third, the intergovernmental transfer (IGT) fund consisted of block grant (\( \text{dana alokasi umum/DAU} \)), special purpose grant (\( \text{dana alokasi khusus/DAK} \)), the natural resources and the tax sharing fund. The latter two funds are proportional percentage of natural resources and taxes that the districts receive from the central government and other districts. Finally, the \( Z \) refers to control variables that include share of urban population, share of people with minimum education of junior high school and the share of labour per district.

The following table presents variable descriptive statistics included in the analysis (Table 1).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local government capital spending</td>
<td>4084</td>
<td>41554</td>
<td>83935.98</td>
<td>0</td>
<td>1546582</td>
</tr>
<tr>
<td>Owned-source revenues</td>
<td>4084</td>
<td>20746.7</td>
<td>49842.29</td>
<td>0</td>
<td>972765.9</td>
</tr>
<tr>
<td>Shared tax revenues</td>
<td>3658</td>
<td>44866.11</td>
<td>109420.2</td>
<td>0</td>
<td>3146957</td>
</tr>
<tr>
<td>Shared notax revenues</td>
<td>4084</td>
<td>30439.93</td>
<td>192769.9</td>
<td>0</td>
<td>3953847</td>
</tr>
<tr>
<td>General Purpose Grant (DAU)</td>
<td>4084</td>
<td>250423.8</td>
<td>377510</td>
<td>0</td>
<td>6511203</td>
</tr>
<tr>
<td>Special Purpose Grant (DAK)</td>
<td>4084</td>
<td>34935.08</td>
<td>63856.53</td>
<td>0</td>
<td>1150743</td>
</tr>
<tr>
<td>Gross Regional Domestic Product (GRDP)</td>
<td>4084</td>
<td>3975870</td>
<td>6328492</td>
<td>0</td>
<td>81900000</td>
</tr>
<tr>
<td>Population</td>
<td>4088</td>
<td>700681</td>
<td>731258.1</td>
<td>22734</td>
<td>8963218</td>
</tr>
<tr>
<td>Percent population that is urban</td>
<td>1935</td>
<td>36.6581</td>
<td>41.7188</td>
<td>0.273906</td>
<td>100</td>
</tr>
<tr>
<td>Percent population that has junior education</td>
<td>1960</td>
<td>5.578926</td>
<td>7.283132</td>
<td>0.015282</td>
<td>86.30364</td>
</tr>
<tr>
<td>Percent share of labour</td>
<td>3594</td>
<td>0.016575</td>
<td>0.031062</td>
<td>1.95E-05</td>
<td>0.35258</td>
</tr>
</tbody>
</table>
4. Empirical Estimation and Findings

**Absolute Convergence**

The table below provides evidence of regional convergence in Indonesia (Table 2). In the table, column (1) and (2) shows that the convergence rate in decentralisation are higher than in the centralized regime, 1.8 per cent and 27.2 per cent respectively. The variance in regional convergence is also explained more in the decentralisation period regression with 28.1 per cent compared with the previous period. While column (3) displays long-term convergence analysis for 1994 – 2006 that implies a significant convergence, explaining that with 95 per cent of confidence, GRDP per capita of poorer districts grows faster than richer districts at a rate of 0.6% annually. For the long-term analysis, the regression could only explain by 3% of variance of economic growth with 3400 observations throughout 12 years of period under observation.

**Table 2. Regional Absolute Convergence**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GRDP Initial</td>
<td>-0.028**</td>
<td>-0.272**</td>
<td>-0.063**</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(-0.010)</td>
<td>(-0.006)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.458**</td>
<td>4.321**</td>
<td>1.047**</td>
</tr>
<tr>
<td></td>
<td>(-0.069)</td>
<td>(-0.157)</td>
<td>(-0.089)</td>
</tr>
<tr>
<td>N</td>
<td>1936</td>
<td>1751</td>
<td>3396</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.018</td>
<td>0.281</td>
<td>0.03</td>
</tr>
</tbody>
</table>

*, **, and *** are 10 per cent, 5 per cent, and 1 per cent significance, respectively

**Fiscal Decentralisation Impact on Infrastructure Spending**

The following table shows the impact of local government revenues on regional infrastructure spending (Table 3). There are six points highlighted from the regression, first the adjusted $R^2$ of the FE model is high at 84 percent and it is higher than Lewis (2013) that used similar method for the period between 2003 and 2010. The Wald statistic for the GMM is highly significant and the Sargan test confirms that the instruments are valid. Each of the regression also has large numbers of variables with statistically significant coefficients and expected signs.

Second, the first and second lags of the capital expenditure are significant suggesting the importance of using such dynamic analyses. As both lags has positive signs, this shows that an increase in government spending in one period results in a higher capital spending in the next period and further increase in the following period. However, there is a slight decline in the increase margin.

Third GRDP and population are statistically significant determinant of local government infrastructure spending. An extra rupiah of per capita output decreases...
infrastructure spending by 0.001 rupiah in real terms. While an increase of one person results in 0.002 rupiah of infrastructure spending.

Fourth, control and economic structure variables are significant and have the expected signs. The analysis suggest that districts that are more urbanised, higher share of education people and manufacturing labour tend to have higher infrastructure expenditure.

Fifth, in opposite with findings by Lewis (2013) on the importance of DAK, this paper found that DAU have higher impact on local spending between 1993 and 2006. The regression estimate that an additional rupiah of per capita DAK leads to a 0.072 rupiah per capita increase in local infrastructure spending, while an additional per capita DAU leads to a 0.144 rupiah per capita increase. This significant difference with previous study could be explained by the different time period of analysis. With including the pre-decentralisation period, the DAK and DAU impact are possibly undermine compared if it is studied solely in the decentralisation period.

The following table (Table 4) address this and also compares determinants of local infrastructure spending between municipalities and regencies. The table shows a different impact of owned source revenue. In the decentralisation period, owned source revenue significantly determines local infrastructure spending. However, there is a difference between municipality and regency spending behaviour. An extra one rupiah of owned source revenue leads to an increase of 0.3 rupiah of infrastructure spending in a municipality, and only 0.25 of infrastructure spending in regency.

Comparing results with Lewis (2013) on DAK and DAU effects reveals that DAK is persistently have lower effect on infrastructure spending. A slightly different condition if we distinguish municipalities and regencies. It is suggested that DAK have higher effect on infrastructure spending in regencies compared in municipalities. This may suggest that the number of recipients of DAK is poorer and lagging districts which are dominantly regencies.

An interesting finding is that control and economic structure variables are insignificant in explaining infrastructure spending in the municipalities. This suggest that infrastructure spending in the municipalities is only determine by the number of population, which an increase of one person leads to an extra 0.012 rupiah of infrastructure spending.
### Table 3. Impact of Own-source and Intergovernmental Transfer Revenues on Infrastructure Spending, 1993-2006

<table>
<thead>
<tr>
<th></th>
<th>FE</th>
<th>GMM</th>
</tr>
</thead>
<tbody>
<tr>
<td>First lag local government capital spending</td>
<td>-</td>
<td>0.498**</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-0.01</td>
</tr>
<tr>
<td>Second lag local government capital spending</td>
<td>-</td>
<td>0.324**</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-0.01</td>
</tr>
<tr>
<td>Owned-source revenues</td>
<td>0.209**</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>-0.03</td>
<td>-0.01</td>
</tr>
<tr>
<td>Shared tax revenues</td>
<td>0.085**</td>
<td>0.037**</td>
</tr>
<tr>
<td></td>
<td>-0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>Shared nontax revenues</td>
<td>0.111**</td>
<td>0.036**</td>
</tr>
<tr>
<td></td>
<td>-0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>General Purpose Grant (DAU)</td>
<td>0.172**</td>
<td>0.144**</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Special Purpose Grant (DAK)</td>
<td>0.03</td>
<td>0.072**</td>
</tr>
<tr>
<td></td>
<td>-0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>Gross Regional Domestic Product (GRDP)</td>
<td>0.00</td>
<td>-0.001**</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Population</td>
<td>0.01</td>
<td>0.002**</td>
</tr>
<tr>
<td></td>
<td>-0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>Percent population that is urban</td>
<td>-17.97</td>
<td>97.216**</td>
</tr>
<tr>
<td></td>
<td>-37.97</td>
<td>-16.80</td>
</tr>
<tr>
<td>Percent population that has junior education</td>
<td>403.78*</td>
<td>1125.76**</td>
</tr>
<tr>
<td></td>
<td>-164.81</td>
<td>-44.63</td>
</tr>
<tr>
<td>Percent share of labour</td>
<td>-52018.89</td>
<td>279171.96**</td>
</tr>
<tr>
<td></td>
<td>-96070.54</td>
<td>-36460.67</td>
</tr>
<tr>
<td>Constant</td>
<td>-21967.03</td>
<td>-35297.07**</td>
</tr>
<tr>
<td></td>
<td>-12528.45</td>
<td>-1073.41</td>
</tr>
<tr>
<td>Adj R2</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>Number of observations</td>
<td>1441</td>
<td>1440.00</td>
</tr>
<tr>
<td>Groups</td>
<td>288</td>
<td>288.00</td>
</tr>
<tr>
<td>Instruments</td>
<td>-</td>
<td>51.00</td>
</tr>
<tr>
<td>Wald statistic</td>
<td></td>
<td>217201</td>
</tr>
<tr>
<td>Chi-square probability</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Sargan statistic</td>
<td>183.04</td>
<td></td>
</tr>
<tr>
<td>Chi-square probability</td>
<td>0.00</td>
<td></td>
</tr>
</tbody>
</table>

*a Dependent variable is local spending on infrastructure. All fiscal and economic variables are measured in real per capita terms. Estimation is by fixed effects (FE) and generalized method of moments (GMM).

b *, **, and *** are 10 per cent, 5 per cent, and 1 per cent significance, respectively
Table 4. Impact of Own-source and Intergovernmental Transfer Revenues on Infrastructure Spending in Decentralisation Period, 2001-2006a

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Municipalities</th>
<th>Regencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>First lag local government capital spending</td>
<td>0.486**</td>
<td>0.414**</td>
<td>0.622**</td>
</tr>
<tr>
<td></td>
<td>-0.01</td>
<td>-0.03</td>
<td>-0.01</td>
</tr>
<tr>
<td>Second lag local government capital spending</td>
<td>0.332**</td>
<td>0.170**</td>
<td>0.259**</td>
</tr>
<tr>
<td></td>
<td>-0.01</td>
<td>-0.02</td>
<td>-0.01</td>
</tr>
<tr>
<td>Owned-source revenues</td>
<td>0.087**</td>
<td>0.307**</td>
<td>0.250**</td>
</tr>
<tr>
<td></td>
<td>-0.02</td>
<td>-0.02</td>
<td>-0.01</td>
</tr>
<tr>
<td>Shared tax revenues</td>
<td>0.009+</td>
<td>-0.351**</td>
<td>0.051**</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>-0.07</td>
<td>0.00</td>
</tr>
<tr>
<td>Shared nontax revenues</td>
<td>0.047**</td>
<td>0.454**</td>
<td>0.018**</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>-0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>General Purpose Grant (DAU)</td>
<td>0.157**</td>
<td>0.129**</td>
<td>0.131**</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>-0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>Special Purpose Grant (DAK)</td>
<td>0.084**</td>
<td>0.105**</td>
<td>0.143**</td>
</tr>
<tr>
<td></td>
<td>-0.02</td>
<td>-0.03</td>
<td>-0.01</td>
</tr>
<tr>
<td>Gross Regional Domestic Product (GRDP) pc</td>
<td>0.000*</td>
<td>0.00</td>
<td>-0.000**</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Population</td>
<td>0.00</td>
<td>0.012**</td>
<td>-0.008**</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Percent population that is urban</td>
<td>233.24**</td>
<td>22.72</td>
<td>-195.79**</td>
</tr>
<tr>
<td></td>
<td>-42.52</td>
<td>-109.41</td>
<td>-28.12</td>
</tr>
<tr>
<td>Percent population that has junior education</td>
<td>11234.44**</td>
<td>4933.59</td>
<td>6897.685**</td>
</tr>
<tr>
<td></td>
<td>-1099.55</td>
<td>-3897.56</td>
<td>-610.45</td>
</tr>
<tr>
<td>Percent share of labour</td>
<td>280166.71**</td>
<td>71036.82</td>
<td>403834.33**</td>
</tr>
<tr>
<td></td>
<td>-33663.19</td>
<td>-108840.94</td>
<td>-69908.27</td>
</tr>
<tr>
<td>Constant</td>
<td>-85913.81**</td>
<td>-39517.57**</td>
<td>-48727.72**</td>
</tr>
<tr>
<td></td>
<td>-3474.27</td>
<td>-10751.27</td>
<td>-1861.53</td>
</tr>
</tbody>
</table>

R²
Number of observations 917 200 717
Groups 268 56.00 212
Instruments 35 35 35
Wald statistic 70794.4 88100000 2450000
Chi-square probability 0.000 0.000 0.000
Sargan statistic 147.90 46.22 137.06
Chi-square probability 0.000 0.000 0.000

a Dependent variable is local spending on infrastructure. All fiscal and economic variables are measured in real per capita terms. Estimation is by fixed effects (FE) and generalized method of moments (GMM).
b *, **, and *** are 10 per cent, 5 per cent, and 1 per cent significance, respectively.
5. Conclusions and Policy Implications

From the empirical studies, we can draw several conclusions. First, all regression analysis shows significant effect of lag capital spending, suggesting a potential bias if dynamic analysis is omitted. Second, the research gives evidence of increasing significant effect of owned source revenue and intergovernmental transfers (IGT) on local infrastructure spending. In particular, this result reflects that despite wide autonomy on administrative and political power, intergovernmental fiscal transfer remains insignificant determinant for local economic development.

This research contributed to policy development in several ways. First, the research finding suggests mixed effects of fiscal decentralisation. As local revenue is promotes regional disparities, a revision of law should allow districts to set rates on major taxes, administer the collection and retain the collected revenues, such as the property tax. The law no. 34/2004 has attempted to tackle this issue with further revenue sharing between the central, provincial, and district; however this study omitted to analyses the impact of the new regulation as its effect begins in 2006, which are not included in this study's time period.

Second, another alternative is to improve the appropriate amount intergovernmental transfer budget that is specifically designed to meet individual districts development requirement. The lack of precise block grant calculation has been acknowledged since the early years of decentralisation witness the effect of miscalculation on each district needs leads to significant transfer gaps between rich and poor districts (Fane, 2003). The different effect of DAU on infrastructure spending between municipalities and regencies illustrates this issue.

References


INTER_REGIONAL COLLABORATION MODEL IN WATER SUPPLY PROVISION

Sri MARYATI¹, I Gusti Ayu ANDANI², Heru Purboyo Hidayat PUTRO³

Abstract
Water source is an environmental element in water supply system. Without source of water, there is no water supply system. Water supply system in Indonesia is based on administrative boundary, whereas the existence of water source does not depend on administrative boundary. Some regions have water source, but others do not. This fact shows that collaboration is an important thing in providing water. This study aims to determine the proper model of collaboration between regions in water supply provision, especially in providing water source for PDAM (Indonesian Regional Water Supply Company). The objectives of the study are 1) identification of alternative models of collaboration based on literature and best practices, 2) identification of criteria which determine the success of interregional collaboration, and 3) comparison between existing condition and success criteria of interregional collaboration. The study used Kota Bandung (PDAM Tirtawening) and Kabupaten Bandung (PDAM Tirta Raharja) as case and the collaboration is focused on providing water source. The proper model was determined by using Analytical Network Process (ANP) and weighting analysis. The result of analysis shows that the proper model of interregional collaboration between Kota Bandung and Kabupaten Bandung for PDAM water source is joint-agreement. In order to be sustained, the collaboration have to be supported by formal document and integration of collaboration into regional planning system, budgeting sharing as well as strong institutional commitment.

Keywords: analytical network process, inter-regional collaboration, water source, water supply provision

1. Introduction
Decentralization and privatization through Act No. 22 of 1999 and Act No. 32 of 2004 on Regional Government and Act No. 7 of 2004 on Water Resources encourages the increasing number of water service providers. The number of water providers until 2010 had increased by 112 to 402 providers, 83 of them were in urban area and 319 of them were in the suburban/rural area (Perpamsi, 2010).

Increasing number of water providers complicate the provision of water supply. Increasing water service provider will require new source of water. This has become one of the obstacles of water supply provision because not all of the autonomous

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regions have adequate water sources. It is therefore collaboration in water supply provision is needed.

Inter-regional collaboration has been regulated in the Indonesian Government Regulation Act. No 50 of 2007 on Procedures for Regional Collaboration. Based on this regulation, the collaboration is established by using the principles of efficiency, effectiveness, synergy, mutual benefit, mutual agreement, good faith, priority to national interests, and territorial integrity of Republic of Indonesia, equality, transparency, fairness, and legal certainty. Although the importance of inter-regional collaboration has been realized, some facts show that collaboration between regions experienced a lot of failure (Miharja, 2012) due to the excessively regional egoism (Keban, 2012). This failure resulted in unsuccessful efforts to provide urban services. There are two main questions to be answered, what are the success criteria of inter-regional collaboration and what is the most appropriate model for inter-regional collaboration in the provision and management of urban services. Research to answer the question above need to be conducted in order to make a decision about collaboration model that can be applied in the provision of urban services, in this study the main focus of urban services is the provision of water source. The study used collaboration between Kota Bandung (PDAM Tirtawening) and Kabupaten Bandung (PDAM Tirta Raharja) in providing water as case study.

2. Success Criteria and Model for Inter-regional Collaboration in Providing Water Source for Public Water Supply

The success of inter-regional collaboration depends on some factors or criteria. The factors can be classified as law, stakeholder, and financing. Furthermore, the factors consist of some sub aspects or sub criteria, as can be seen in Table 1.

<table>
<thead>
<tr>
<th>No.</th>
<th>Criteria</th>
<th>Sub-criteria</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Law</td>
<td>Supported legal aspect</td>
<td>- Regulatory frameworks that support the implementation of cooperation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- National strategy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Integration into regional</td>
<td>- Meet local needs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>planning system.</td>
<td>- Priority interest of region</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Formal document of collaboration</td>
<td>- Long-term collaboration</td>
</tr>
<tr>
<td>2</td>
<td>Stakeholder</td>
<td>Institutional commitment and</td>
<td>- Consensus between institutions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>trust</td>
<td>- Supportive leadership</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Control and responsibility</td>
<td>- Clear institutionalization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sharing</td>
<td>- Distribution of power</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Readiness and performance of</td>
<td>- Binding obligations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Coordination between sectors / institutions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Government and human resource capacity</td>
</tr>
</tbody>
</table>

Table 1. The Success Criteria of Inter-regional Collaboration in Water Supply Provision for Public Water Supply Company (PDAM)
<table>
<thead>
<tr>
<th>No.</th>
<th>Criteria</th>
<th>Sub-criteria</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>stakeholder</td>
<td></td>
<td>The existence of the executive institution and related sectors</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The role of local legislative bodies</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Knowledge and skills of human resources</td>
</tr>
<tr>
<td>8</td>
<td>Multi-stakeholder participation</td>
<td></td>
<td>Professionals involvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Private sector involvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Public monitoring and evaluation</td>
</tr>
<tr>
<td>9</td>
<td>Compensation system</td>
<td></td>
<td>Fees charged to user</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Incentives for institutions involved</td>
</tr>
<tr>
<td></td>
<td>Budgetting Sharing</td>
<td></td>
<td>Coordination in the operation and maintenance budgeting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Transparency and accountability of financial management system</td>
</tr>
</tbody>
</table>

Source: Fabiano Kwale and M. Srager, 1990; Young, 1992; Edralin, 1997; Kickert, et.al, 1997; Abdurrahman, 2005; Sanctyeka, 2009

There are some models for inter-regional collaboration of water supply provision. Henry (1995) stated that there were intergovernmental service contract, joint service agreement, and intergovernmental service transfer as alternative models of collaboration. Taylor (2003) stated that there were handshake agreement, fee for service contract, joint service contract, jointly-formed authorities, and regional bodies as models of collaboration. Indonesia’s City Government Association stated that cooperation body; coordination forum; monitoring, evaluation, and coordination forum; and jointly cooperation can be used as model of collaboration. For water supply provision collaboration, especially related to water resource handshake agreement; fee for service contracts; coordination, monitoring, and evaluation forum, as well as joint agreement can be applied as an alternative models of collaboration.

- **Handshake agreement**
  This collaboration model is based on commitment and trust between regions. It is characterized by the absence of formal collaboration document. In this case study, Kabupaten Bandung government may give authority for PDAM Tirtawening of Kota Bandung to obtain the water from water sources in the region.

- **Fee for service contracts**
  This model is basically a condition where one region "sell" public service in the other region area. In terms of collaboration of providing water supply, either PDAM Tirtawening or PDAM Tirta Raharja can build unit of water by utilizing both water utilization permission (SIPPA – Surat Izin Pemanfaatan dan Penggunaan Air Tanah) and others pay to obtain water from water intake which built by other region.

- **Coordination, Monitoring, and Evaluation Forum**
  A forum whose role is to formulate, communicate, and coordinate plans and activities in collaborated sectors. The forum also conduct monitoring and evaluation of the activities specified in the plan. Collaboration scope in this
model involves the coordination of technical implementation, budgeting, monitoring and evaluation of the program. In this case study, PDAM Tirtawening and PDAM Tirta Raharja may coordinate in terms of water resources management, such as involve in Cisangkuy River conservation efforts to maintain the water source for the future.

- Joint Agreement
  This model essentially requires the full participation or involvement of each region involved in the provision or management of public services. Local governments share ownership and responsibility for the program. Joint agreement is similar to a joint venture where two or more public water supply company may collaborate in the construction of the water supply unit, which starts from the intake to the transmission network.

3. Methods

Determination of success criteria of inter-regional collaboration in the provision of water source is based on literature of provision of clean water infrastructure and inter-regional collaboration which is then adjusted on empirical conditions. Determination of success criteria is conducted in three phases, namely identification phase, verification, and criteria determination.

In the identification phase, literature study is used to identify criteria that are considered influence the success of inter-regional collaboration in the provision of water source. Furthermore, in verification phase, criteria which mutually overlapping each other is eliminated. The success criteria as a result of identification, verification, and criteria determination phase is shown in Table 1.

Determination of inter-regional collaboration models that will be studied for the provision of water source are based on literature. Inter-regional collaboration model that have been evaluated, namely: handshake agreement (Model I), fee for service contracts (Model II), coordination, monitoring, and evaluation forum (Model III), joint agreement (Model IV).

This study used Analiticcal Network Process (ANP) to determine the criteria and sub-criteria that most affect the success of the collaboration and also weighting analysis to determine the most appropriate model for collaboration.

4. Analysis

4.1. Linkage Matrix and Networks Model

The initial steps to determine the proper inter-regional collaboration model in the provision of water source to PDAM Tirtawening and PDAM Tirta Raharja was to
construct a linkage matrix and network model of criteria and sub-criteria that will be used further to determine the priority criteria for the success of inter-regional collaboration in the provision of water source.

Linkage matrix and network model was used as the basis for criteria and sub-criteria scoring based on the opinion of expert respondents on the criteria (clusters) and sub-criteria (elements) that influence the success of inter-regional collaboration for the provision of water source. In Figure 1 we can see the linkage matrix between criteria and sub-criteria as the first step to construct the network model. The network model can be seen in Figure 2.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Law</th>
<th>Stakeholder</th>
<th>Financing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supported legal aspect</td>
<td>Integration into regional planning system</td>
<td>Inter-agency commitment and trust</td>
<td>Control and responsibilities sharing</td>
</tr>
<tr>
<td>Support legal aspect</td>
<td>Integration into regional planning system</td>
<td>Readiness and performance of stakeholder</td>
<td>Multi-stakeholder participation</td>
</tr>
<tr>
<td>Law</td>
<td>Formal document of collaboration</td>
<td>Compensatory system</td>
<td>Budgetting sharing</td>
</tr>
</tbody>
</table>

**Figure 1. Linkage Matrix Between Criteria and Subcriteria**

In network model, there is a dependency connection between elements and clusters. The network model consists of three clusters of criteria which divided into 9 sub-criteria. Interaction between elements in the model is illustrated by an arrow or a...
loop. The arrows depict the interaction between elements in different clusters, such as arrows drawn on the interaction between element of 'supported legal aspect' within 'law' cluster with element of 'institutional commitment and trust' within 'stakeholder' cluster. This indicates that the existence of legal aspects will increase the commitment and trust among institutions involved.

4.2. Criteria and Subcriteria Scoring

Criteria or Clusters Scoring

In cluster scoring, pairwise comparisons was conducted on criteria or clusters (cluster of ‘law’, cluster of ‘stakeholder’, and cluster of ‘financing’) in network model. Scoring of clusters aims to see the interaction among clusters and also to identify the importance of each element in a cluster.

In Table 2, it can be seen that the biggest value in total columns is 0.5 which generated by ‘law’ cluster. Therefore, the law or legal aspects are criteria that mostly affect the success of inter-regional collaboration in the provision of water source for PDAM Tirtawening and PDAM Tirta Raharja. Value 0 in the table shows that there is no any interaction between the clusters. So if increasing value occurs in the cluster, it will not affect the other cluster.

The value in the column indicates that there is interaction between clusters. Any changes in one cluster will affect the value in the other clusters. This change can be illustrated on ‘financing’ cluster as shown in Table 2. Any changes in ‘financing’ cluster will affect ‘law’ and ‘stakeholder’ clusters, however it did not affect elements within.

<table>
<thead>
<tr>
<th></th>
<th>Law</th>
<th>Stakeholder</th>
<th>Financing</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Law</td>
<td>0.500</td>
<td>0.500</td>
<td>0.667</td>
<td>0.500</td>
</tr>
<tr>
<td>Stakeholder</td>
<td>0.250</td>
<td>0.250</td>
<td>0.333</td>
<td>0.250</td>
</tr>
<tr>
<td>Financing</td>
<td>0.250</td>
<td>0.250</td>
<td>0.000</td>
<td>0.250</td>
</tr>
<tr>
<td>Total</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Sub-criteria or Elements Scoring

Success sub-criteria of inter-regional collaboration can be prioritized based on gained score from each element. This score can be generated from the calculation of pairwise comparison. Based on the calculations, ‘formal document’ is the most important element (0.17320), followed by ‘integration into regional planning system’ (0.16203), and ‘budgetting sharing’ (0.146654). The least important element is ‘multi-stakeholder participation’ (0.053319). Scores for each element can be seen at Table 3 and Figure 3. Score of these elements shown that the presence of formal document is the most important aspect in order to support the sustainability or success of the inter-regional collaboration between Kota Bandung and Kabupaten Bandung.
Table 3. Subcriteria or Elements Scores

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Element</th>
<th>Scores per Cluster</th>
<th>Net Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Law</td>
<td>Supported legal aspect</td>
<td>0.19463</td>
<td>0.081015</td>
</tr>
<tr>
<td></td>
<td>Integration into regional planning system</td>
<td>0.38927</td>
<td>0.16203</td>
</tr>
<tr>
<td></td>
<td>Formal document of the collaboration</td>
<td>0.41610</td>
<td>0.17320</td>
</tr>
<tr>
<td>Stakeholder</td>
<td>Institutional commitment and trust</td>
<td>0.32752</td>
<td>0.116788</td>
</tr>
<tr>
<td></td>
<td>Control and responsibility sharing</td>
<td>0.23152</td>
<td>0.082554</td>
</tr>
<tr>
<td></td>
<td>Readiness and performance of stakeholder</td>
<td>0.29143</td>
<td>0.103918</td>
</tr>
<tr>
<td></td>
<td>Multi-stakeholder participation</td>
<td>0.14953</td>
<td>0.053319</td>
</tr>
<tr>
<td>Financing</td>
<td>Compensation system</td>
<td>0.35444</td>
<td>0.08052</td>
</tr>
<tr>
<td></td>
<td>Budgetting Sharing</td>
<td>0.64556</td>
<td>0.146654</td>
</tr>
</tbody>
</table>

Figure 3. Sub-criteria Priority

4.3. Success Criteria Parameters of Inter-regional Collaboration in Providing Water Source

Success criteria parameters consists of three ordinal rating category, high (H), medium (S), and low (R). Each alternative model of collaboration will be evaluated based on criteria parameters. Parameter of success criteria of inter-regional collaboration in the provision of water source shown in Table 4.
<table>
<thead>
<tr>
<th>Category</th>
<th>Parameter</th>
</tr>
</thead>
</table>
| **Formal document of collaboration**                                    | **H** Alternative implementation models take the form of long-term formal documents. This document set the obligations, rights, and sanctions for the parties involved in the collaboration.  
**M** Formal documents as evidence of the implementation of the collaboration is limited to statement of collaboration. This document does not stipulate sanctions for the parties involved in the collaboration. This document also has no any legal force for the parties involved.  
**L** Collaboration is only based on the belief and the commitment of the parties involved without any formal document |
| **Integration into regional planning system**                          | **H** Collaboration through the implementation of alternative model has been integrated in the system of regional planning  
**M** Water source provision through inter-regional collaboration has been integrated in the system of regional planning, but have not yet considered alternative models of collaboration.  
**L** There has been no statement of inter-regional collaboration in water supply provision in the regional planning system. |
| **Budgetting Sharing**                                                 | **H** Inter-regional collaboration is manifested in coordination of budgeting. The existence of financial transparency and accountability, both in terms of planning, operation, and maintenance of water supply system.  
**M** There is budgeting coordination mechanism on collaborated objects between the regions involved.  
**L** There is no coordination of budgeting, transparency, and accountability in financial management. |
| **Control and responsibility sharing**                                 | **H** Each element of the local government supports the implementation of the collaboration model  
**M** Collaboration is carried out and supported only by the relevant regional institutions.  
**L** Related institutions in the provision of water source does not support the implementation of the collaboration model. |
| **Readiness and performance of development stakeholder**               | **H** The collaboration model is easy to implement because it does not involve many stakeholders and various prerequisites.  
**M** The collaboration model is quite easy to implement, but it requires a long preparation time.  
**L** The cooperation model is fairly difficult to implement because it requires a long time to negotiate and reach agreement |
| **Control and responsibilities sharing**                               | **H** Regions which collaborated have the same portion of control and responsibility  
**M** Regions which collaborated did not have the same portion of control and responsibility  
**L** There is no sharing control and responsibility. |
| **Supported legal aspects**                                            | **H** Implementation of this collaboration model has been regulated in local laws and codes.  
**M** There is no legal support for the implementation of this collaboration model.  
**L** There is no legal support for the implementation of this collaboration model. |
I n t e r n a t i o n a l  C o n f e r e n c e  • 2 1 - 2 2  O c t o b e r  2 0 1 3 •  I T B ,  B a n d u n g

<table>
<thead>
<tr>
<th>Category</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Local laws and regulations that exist simply regulate on the implementation of collaboration</td>
</tr>
<tr>
<td>L</td>
<td>Inter-regional collaboration is not regulated in the local laws and regulations</td>
</tr>
</tbody>
</table>

**Compensation System**

<table>
<thead>
<tr>
<th>Category</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>There is a compensation given to regions that have any resource. The compensation can supports realization of the principle of cost recovery.</td>
</tr>
<tr>
<td>M</td>
<td>Compensation or incentives to regions that have any resource does not supports realization of the principle of cost recovery</td>
</tr>
<tr>
<td>L</td>
<td>There is no compensation or incentive for the regions.</td>
</tr>
</tbody>
</table>

**Multi-stakeholder participation**

<table>
<thead>
<tr>
<th>Category</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>The whole process of providing water source conducted by the government and its partners (either professional, private, or community). The process of providing the water source starts from the planning, implementation, monitoring, and evaluation program.</td>
</tr>
<tr>
<td>M</td>
<td>Professionals, private, and community involved in just one step in the process of providing water source for public water supply company (PDAM).</td>
</tr>
<tr>
<td>L</td>
<td>Local governments do not have any partners to collaborate in the provision of water source.</td>
</tr>
</tbody>
</table>

### 4.4. Valuation of Alternative Models Based on Success Criteria Parameters of Inter-regional Collaboration

Alternative models of inter-regional collaboration which can be applied in Kota Bandung and Kabupaten Bandung in terms of water source provision for PDAM Tirtawening and PDAM Tirta Raharja are 1) handshake agreement, 2) fee for service contract, 3) coordination, monitoring, and evaluation forum, 4) joint agreement. These alternative models will be assessed based on the parameters of success criteria of inter-regional collaboration. The valuation can be seen in Table 5.

<table>
<thead>
<tr>
<th>No</th>
<th>Subcriteria</th>
<th>Valuation of Alternative Model Category</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| I  | Formal document of collaboration | L M M H | • There is no document formal in the application of Alternative Model I.  
• Alternative Model II using contract document which contains of rights and obligations of each party involved. However, collaboration using this model usually conducted in short-term.  
• In alternative model III, there is no any clause of sanction that can bind the member, so the sustainability of the collaboration is can not ensure.  
• Alternative model IV using formal document which regulate rights, obligations, and sanctions for each party involved. |
<table>
<thead>
<tr>
<th>No</th>
<th>Subcriteria</th>
<th>Valuation of Alternative Model Category</th>
<th>Explanation</th>
</tr>
</thead>
</table>
|    | Integration into regional planning system | I II III IV                            | • Actually, regional water supply provision is already stated in Kabupaten Bandung and Kota Bandung regional plan. Regional water supply provision is also ordered in Masterplan of Regional Water Supply Infrastructure of Bandung Metropolitan Area. In the masterplan, there is already a mutual agreement for initializing regional water supply infrastructure in the form of joint agreement program. Thus the achievement of alternative model IV is categorized high (H).  
• In this agreement, there is a coordination, monitoring, and evaluation of the program. Therefore, we categorize Alternative Model III as high (H).  
• Since collaboration using Alternative Model I and II are usually conducted in short-term collaboration, the collaboration is not integrate into regional planning system. |
| 3  | Budgetting Sharing                      | I II III IV                            | • Alternative Model I and II is categorized as low (L) because there is no any mechanism of budgetting coordination between parties involved.  
• Alternative Model III is categorized as medium (M) because it does not support the transparent and accountable financial management system, thought it supports the budgetting coordination.  
• Alternative Model IV is categorized as high (H) because there is mechanism of budgetting coordination in the model implementation. Alternative model IV is involving many stakeholders, thus a transparent and accountable system is urgently needed in the collaboration. |
| 4  | Institutional commitment and trust      | I II III IV                            | • Commitment and trust is the main foundation of the implementation of alternative collaboration model I. Thus alternative model I is categorized as high (H).  
• Collaboration using model II and III tends to be conducted only on certain institution in the region, not entirely. Thus these models is categorized as medium (M).  
• Alternative model IV is categorized as high (H) because collaboration using this model can be implemented if there is a strong commitment and trust between each institution in the regions. |
| 5  | Readiness and performance of the stakeholders | I II III IV                            | • Collaboration using alternative model I usually conducted on municipalities which often collaborating. This collaboration model is quite efficient and more flexible because there is no obligations which embodied each party involved. Thus alternative model I is categorized as high (H). |
### No Subcriteria | Valuation of Alternative Model Category | Explanation
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
</tr>
<tr>
<td>6</td>
<td>Control and responsibility sharing</td>
<td>M</td>
</tr>
</tbody>
</table>

- Alternative Model II is categorized as medium (M). The implementation of alternative model II is quite easy because the pre-condition to be fulfilled is only compensation mechanism and the period of collaboration. However, this collaboration sometimes takes longer time in the process of negotiation.
- Alternative Model III is also rated medium (M). In implementation of the model, negotiation is needed to coordinate budgetting, execution, monitoring, and evaluation.
- Alternative Model IV is categorized as low (L) because it is difficult to implement. This collaboration model needs the readiness of the entire institutions of the regions, whether legislative or executive body.

| 7 | Supported legal aspects | L | H | L | H |

Alternative Model II and IV are categorized as high (H) because legal acts of inter-regional collaboration in either Kota Bandung or Kabupaten Bandung, stated that the inter-regional collaboration can be conducted in the form of lease contract or joint collaboration.

| 8 | Compensation systems | L | H | L | H |

- Alternative Model I and III is categorized as low (L) because these collaboration models have no clear incentive and disincentive mechanism for parties involved.
- Alternative Model II is categorized as high (H). Basically in this collaboration model, a region provide public services to other region and it will be paid for the services.
- Alternative Model IV is also rated high (H) because this collaboration model using incentive and disincentive mechanism to guarantee the sustainability of the program.
4.5. Determination of Appropriate Model of Inter-Regional Collaboration in Water Supply Provision between PDAM Tirtawening and PDAM Tirta Raharja

Alternative collaboration model in the provision of water source for PDAM Tirtawening and Tirta Raharja can be prioritized using weighting analysis. For each sub-criteria, ‘H’ category is weighted as 3, ‘M’ category is weighted as 2, and ‘L’ category is weighted as 1. The weight for each sub-criteria and for each model is gained from multiplication of score and weight for each category. Total weight for each model is defined as the sum of weight for the whole criteria. Weighting analysis is shown in Table 6.

### Table 6. Weighting Analysis

<table>
<thead>
<tr>
<th>Sub-Criteria</th>
<th>Score</th>
<th>Model I</th>
<th>Model II</th>
<th>Model III</th>
<th>Model IV</th>
<th>Model I</th>
<th>Model II</th>
<th>Model III</th>
<th>Model IV</th>
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<td>M</td>
<td>M</td>
<td>H</td>
<td>0.1732</td>
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<td>L</td>
<td>M</td>
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<td>Budgetting Sharing</td>
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<td>L</td>
<td>M</td>
<td>H</td>
<td>0.146654</td>
<td>0.29308</td>
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<td>0.439962</td>
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<tr>
<td>Institutional commitment and trust</td>
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<td>M</td>
<td>H</td>
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<td>0.233576</td>
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<td>M</td>
<td>M</td>
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Based on weighting analysis, it can be concluded that the most appropriate model for water supply provision collaboration between Kota Bandung and Kabupaten Bandung is Model IV or Join Agreement, follows by Model III (Coordination, Monitoring, And Evaluation Forum), Model I (Handshake Agreement), and Model II (Fee For Service Contract).

5. Conclusion

The most appropriate model for Inter-regional collaboration between PDAM Tirtawening and PDAM Tirta Raharja is joint agreement model. Joint agreement model requires participation of each region in planning, financing, and provisioning of public services. This model needs assignment share, joint responsibility, and possession of all the sector that is collaborated by the regions.

Prerequisite is needed in order to make the inter-regional collaboration of water source for PDAM Tirtawening and Tirta Raharja happen as expected. This collaboration needs strong and distinct legal aspects that can be manifested through formal document of collaboration and through integration of the collaboration into planning system of Kota Bandung and Kabupaten Bandung. The other prerequisite is this collaboration need budget sharing mechanism. All of the regions involved have to have full participation in providing infrastructure and a well designated budget sharing mechanism, a transparent and accountable financial management system. Besides all of those prerequisite, commitment and trust among the institutions is needed to support legal aspect written on formal document and regional planning system. Commitment and trust also required to apply the principles of transparency and accountability in budgeting sharing.

Acknowledgement

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