The evolution of risk and vulnerability in Greater Jakarta: Contesting Government Policy in dealing with a megacity's exposure to flooding. An academic response to Jakarta Floods in January 2013

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Abstract

Greater Jakarta experiences high and vast economic development and population growth over the last three decades. As a home to more than ten million population and over two million daily commuters, the future of the city depends on innovative strategic planning and creative governance for sustainability. The development and expansion of Jakarta are driven by market though local-global drivers facilitated by formal-informal mechanism. While the cities develop tremendously, their exposures to hazards and vulnerabilities increase. With the future scenarios of climate change impacts (i.e sea level rise and floods) coupled withurban environmental problems (e.g. poor waste management, high sedimentation of river channels), Jakarta has a potential to experience series of *black swan* events as in January 2013 flood and it may become an unsustainable city. As the protection against flood risks through adaptive infrastructures is lacking, people and their assets are more exposed to flood risks. This paper highlights the development of Jakarta and it's social-economic-environmental vulnerability. The paper uses formal statistical data, flood historical data and secondary sources to examine the evolution of flood risks in Jakarta over the last three decades. This paper asks: *what are the main factors that contribute to the evolution of risks in Jakarta?* The findings reveal that there is barely connection between government policy related to flood control and the metropolitan development which lead market to shape the unsustained development outcomes exemplified by the fact that built-up areas in Jakarta have been more exposed to flooding uncontrollably. One of the recommendations suggests fundamental reform in the existing megacity planning because that Jakarta and Greater Jakarta needs a grand design for 2100. Fundamental reform in urban planning regimes in Indonesia especially Jakarta is necessary. The Jabodatabek needs a grand design for 50 and 100 years anticipating more 'black swan' and future climate extremes.

1. Introduction

Current debates on megacities highlight the fact that global megacities have been playing important roles on economic development not only because they are connected through economic and political networks, but also due to the scale of influence they play to the hinterlands and networks of cities in the country (Hochrainer and Mechler 2011; Sorensen and Okata 2011; Wisner 2003). The development of megacities is therefore characterized by huge capital investments of local and global private firms. In local economic development, a megacity can offer a large number of opportunities for working and living of residents (Vedeld and Siddham 2002). This phenomenon becomes a pull factor for many migrants to work in a megacity and increases the urbanization.

A megacity often expands beyond a boundary of administrative territory, such as Bangkok, Manila and Jakarta forming a megapolitan that covers several large municipalities. Therefore, the governance of a megacity needs a creative coordination among institutions in these municipalities (Fernandez et al. 2006; Setchell 1995; Talukder 2006; Wenzel et al. 2007). Nevertheless, the speed of growth and increased complexity of cities can go far beyond the capacity of a metropolitan government to comprihand and to handle problems related to public services such as transportation, waste management, water services, health condition and other environmental risks (Kramer et al. 2011; Lundqvist et al. 2005). The problems

escalate when large urbanization becomes uncontrolabled (FIG 2010). Limited space for residential areas, industries and residents' amusements have forced some areas to be encroached and some conservation areas along the coast and hilly areas decrease making physical exposures to 'natural' catastrophe increase (Adikari et al. 2010; Cross 2001; Daniere 1999; Hara et al. 2005).

The economic of scale of megacities attracts large capital investments and invites migrant workers. Thus, the population of megacity steadily increases and even in many cases have not been able to be supported by the city carrying capacity as well as capacity of metropolitanauthority to deal with such problems. In developing countries context, common problems in megacities include the lack of infrastructures, i.e. transportation and water services to meet the demand of the residents and the economic activities. Jakarta suffers from waste distribution problems asits waste treatment was unable to provide adequate support (Pasang et al. 2007; Steinberg 2007). Equally, Jakarta also faces other serious problems such as lack of clean water services, transportation and environmental polution. The road was congested every commuting time, morning and afternoon in Manila (Daniere 1999). Recent flood in Bangkok remind us that the impact of flooding can be devastating and cause collapses in economic activities (Lebel et al. 2011). Many large scale manufacturers had to shut down their operations since the water stayed for more than 2 months (World Bank 2011). The insured and uninsured losses have been dramatic as it affects global supply chain.

Each megacity has it's own characteristics (Parker and Mitchell 1995). This study addresses the research gaps in understanding disasters and megacities through better understanding of the evolution of megacities. This paper explores Jakarta Metropolitan, which is exposed to flooding that has been a regular threat to the cities and the residents. Jakarta Metropolitan Area has been selected for several reasons as follows. *First*, Jakarta is the capital economy of Indonesia with the largest concentration of urban economic activities (Firman 2004; Hudalah and Firman 2012). The surrounding cities have been hinterlands and supported the Jakarta's economy. Disruptions from floodings and other environmental hazards will affect Indonesian economy at large, given the fact that Jakarta houses the seaport that serve 40% of Indonesian containers where most of it pass through the satelite cities from the hinterlands. For instance, the floods in 2007 caused direct economic losses about 4.1 trillion IDR (US$ 450Million) whilst NGOs predicted about 7.3 trillion (US$ 800 million) (Kansal and Suwarno 2007). These calculation do not account the indirect losses from delays and disruptions of supply chains. *Second*, the city has been at risk to several natural hazard impacts (Ward et al. 2011).

The two largestfloods in Jakarta and its satelite cities nearby in 2002 and in 2007 collapsed business and industry activities (Texier 2008). In 2007 alone, 70% area of Jakarta was flooded (Susandi et al. 2011). In January 2013 alone, the total flooded and inundated areas has been affected more area of Jakarta compared to 2007. Therefore, mitigation and preparedness for Jakarta flood will be very important not only for the city itself, but also to maintain the sustainability of economy of Indonesia. Apart from regular flooding, the condition also has been exacerbated by the land subsidence on rate of 1-10 cm per year (Abidin et al. 2008) and sea level rise problems that potentially threat the city (Measey 2010). *Third*, JMA has been projected very prone to climate change impacts in the next 100 year. A study by EEPSEA on climate change vulnerability of 530 urban areas in Southeast Asian Countries mapped three urban areas in Jakarta considered among the highest prone to climate change impacts due to sea level rise (Yusuf and Francisco 2009).

In analyzing megacity, such as Jakarta, the paper argues it will not be possible to put the approach on structural measures (or civil engineering measures) per se. Nevertheless, the structural-measure policy (such as large and giant flood channels) by the metropolitant government seems to be favorable since it is tangible, observable and thus very strategic to satisfy public' concern but this at the same time may create false sense of security. In addition, much focus on structural measures will not be sufficient because it is the vulnerability of the people, properties and infrastructures that are more exposed to the environmental hazards (Wisner 2003; Wisner et al. 2004).

Furthermore, the strucural measure approach will need support from institutions. This paper offers some institutional perspective since investment on infrastructures to counter measure floods will take place only when all stakeholders involved will join efforts. Simanjuntak et.al.(2012) observed that recent flood management plan namely "East Flood Canal" (*Banjir Kanal Timur* or BKT)and "West Flood Canal" (*Banjir Kanal Barat* or BKB) that aimed to discharge the floods water in Eastern Jakarta had been postponed for 33 years, mostly due to disagreement among the stakeholders and some institutional and political problems.

The paper highlights the development of Jakarta and it's social-economic-environmental vulnerability. It seeks to contribute to academic debate concerning the need to undersand cities evolution of vulnerabilities as a starting point for city govenance. It also provides policy relevant information for the governments and academia for institutional reform. The next sections will discuses megacities and risk that occurs in the global context discussed by existing literatures. The next discussion will explain the trend of development in Jakarta Metropolitan Area (JMA), with reference to the development of the industry and the properties. The paper adopts the concept of the megacity problems in Jakarta context and analyzes in term of issues related to market development and government current policy that focuses on the structural measures (engineering measures) to flood hazards. It finally draws discussion and recommend some actions in order to achieve sustainable risk management in JMA.

2. Megacity Risk Governance

2.1. Reguler and extreme problems

Megacities located in coastal areas are highly prone to environmental hazards, especially due to flooding at the low-lying area and also the threats from sea level rise (Nicholls 1995). Recent flooding in Bangkok that affected large areas in Bangkok Metropolitan Area caused around one-fifth of the city area became sub-merged (IDDRI 2011). The most severe impacts by the floods caused the crop failures and stopped some multi-national owned factories, such as Honda and Sony to stop producing for several months(Ten Kate and Yuvejwattana 2011). Economic impacts of disasters in megacities indeed can be very high.

Smaller scale of flooding in megacities can create significant losses for the economy. For instance, a two-hour flood innudation in Jakarta during peak hour time can create hugh traffic jams. In the case of January 2013 floods in Jakarta, many key areas have been submerged below flood water for more than a week (as this paper being working written). Unfortunately, cities government are likely to be concerned with more extreme events rather than to regular problems. Rodolfo and Siringan (2006) observed in Manila Bay that attention

is highly given to global sea level rise rather than to regular environmental problems, such as land subsidence (Delinom et al. 2009) and regular floodings that could cause more frequent problems to the residents. Similarly, in Jakarta the government and residents have been worried with the so-called 'five-year' return period flooding referring to the great Jakarta floods. The authors argue that the January 2013 floods in Jakarta can be turned into a learning lesson because the events bring more opportunity for both academia and the Jakarta authority to think beyond the over simplifying arguments that the floods could be solved with the two magic bullets namely the implementation of "East Flood Canal" (*Banjir Kanal Timur* or BKT) and "West Flood Canal" (*Banjir Kanal Barat* or BKB).

There is no doubt that extreme events need to be taken into account. The case of Indian Ocean Tsunami in 2004 and Hurricane Katrina in 2005 reminded us that catastrophy disasters need to be considered in emergency preparedness. Okada et al (2011) observed large scale disasters, such as earthquake and tsunami could cause much worse impact to megacities, such as Tokyo that was affected by Tohoku Earthquake (2011). Megacity becomes really complex, since more hazard exposures could occur corresponding to the increasing vulnerability.

2.2. Community and Institutional Resilience

Butsch et al (2008) argue that a resilient megacity has to have communities and institutions (rules of the game, regulatory system, smart city bureaucracy) that are able to work effectively against social, economic and ecosystem problems. Both, resilience community and adaptive institution are the core characteristics of flood resilience measures. In line with this, Godschalk (2003) suggests that in order to to achieve a resilience city, it is important to focus on facilitating understanding for city's communities and institutions to reduce hazard risks and respond effectively to disasters. This implies that both communities and institution need to be capacitated to be adaptive and resilience to deal with disasters.

Paton et al (2008) and Sagala et al (2009) observed that community and institutions have to be both interlinked to achieve increased community preparedness. Community may well be equipped when they are empowered by the institutions to deal with beyond reguler problems while institutions will have effective capacities to deal with extreme problems. Nevertheless, in extreme cases, community alert to quick disasters, such as tsunamis and earthquakes are needed much. In the case of great Tohoku earthquake disaster recently, the community's abilities to flee from the tsunami area saves thousands of people. At the same time, strong institutions also supported the process of rehabilitation and recovery to get faster. Normally, strong government can have abilities to provide infrastructures needed to deal with the problems quickly. The subway transportation in Tokyo that was shut down after the short electricity supply due to Tohoku Earthquake was solved within days. Nevertheless, Paton (2006) highlight the need of integration between individual, society and institutional resilience. The integration between these different scales of resilience will ensure that in each level, resilience will be achieved. Without strong governance and institution, community will be at risk and in capable of dealing with large scale disasters. On the other hand, institutions need to be supported with resilient communities so that community can understand what immediate action they need to take when a disaster occurs in their neighborhoods. This is also to ensure that the vulnerable people in the societies have been taken care by other people in the society. Community resilience will likely to promote increasing capacities of people to get more prepared. Indeed, they can also propose to the government what needs to be done at

a lower scale to reduce the underlying risk factors. This also opens up the means for the community to propose and to channel their ideas to the government.

Institutional resilience requires clear understanding by institution on what goals they need to achieve, what resources they can access, and with whom partnership they can established. In the case of developing countries, institutions have skill limitation and have difficulties in defining goals that they deal with. Similarly, financial resources are limited as they normally spend their budget more on operational and less on infrastructure development. Thus, partnership between government institutions and other non-government institutions are needed to strengthen the capacities. Moreover, megacity needs to have a strong institution to deal with complexity problems of a megacity (Firman et al 2010; Sorensen and Okada, 2011).

2.3. Greater JakartaAreas

Jakarta is located at the delta of JMA region. Jakarta covers an area of 662 km2 and ranked as among the biggest cities in the world. According to Firman (2004), Jakarta Metropolitan Area covering an area of approximately 7.500 km2, which consists of 10 administrative units at different levels, namely Jakarta Special Region (DKI Jakarta) at provincial level, municipalities of Bogor, Depok, Tangerang and Bekasi, and the districts of Bogor, Tangerang, Bekasi and Cianjur (see Figure 1) (Firman, 2008). Population of JMA was about 28 million in 2010, while the population of Jakarta City was about 9.6 million (National Central Bureau of Statistics, 2010).

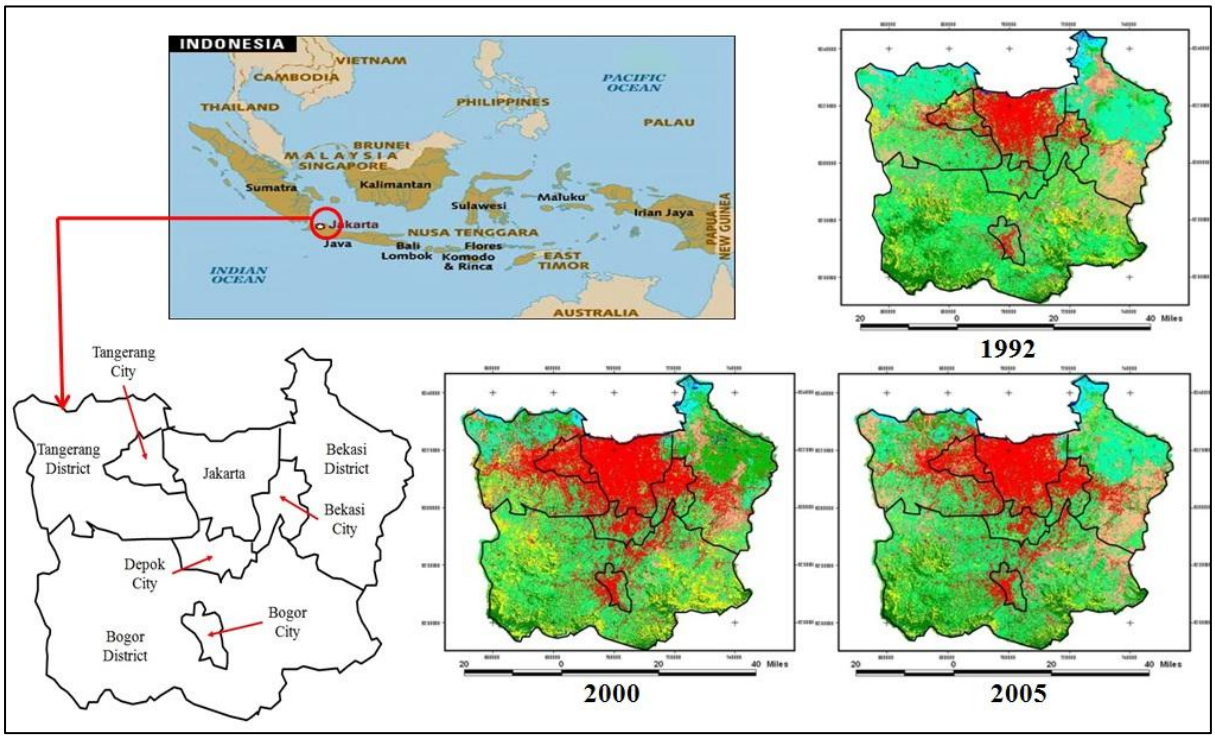

Figure2 Development of Built Up Areas in JMA in 1992, 2000 and 2005

Source: (Rustiadi 2007)

One of major challenges for Jakarta City is also in the management within violation of the urban boundary to the periphery. Since 1955, the metropolitan area had increased nearly tripled (Firman and Dharmapatni 1994). As well as other large cities, the periphery area of Jakarta City has been growing faster than its core area (UNCHS, Nairobi, Kenya, 1996). Rustiadi (2007) noted that based on 2005 data, JMA has about 24.63% of total Indonesia GDP where 11.74% was obtained in DKI Jakarta and 17.22% was obtained in Bodetabek. Furthermore, JMA has high contribution from secondary and tertiary sectors. Firman et al (2010) noted that Jakarta is vulnerable to floods, sea level rise, pollution, ground water excessive extraction and other man made and natural disasters.

The trend of development in Jakarta shows that the development extents from the Capital City to it's surrounding districts (Bodetabek) belonging to other two provinces (West Java and Banten). In 1992, there was only around 11% built up areas in JMA while in 2005, the percentage increases to 29% (Figure 1).These urban areas include the northern part of the city which is the coastal area of Jakarta. This high impact is measured not only by the high potential magnitude of the impacts but also the high density of the population living in this prone area. As Wisner et al (2004) suggest, exposures (population) to the hazards increase the vulnerability as well as risk. Therefore, coastal urban areas with high population density, like many settlements in Jakarta, are very prone to hazards.

2.4. Increasing Flood Vulnerability and Market Led Development

Wisner et al (2004) introduces the concept of the evolution of vulnerability. It suggests that the vulnerability is produced gradually and exacerbated by the social political setting involved in the process. Therefore it is important to understand how the development occurs in JMA and how it contributes to the increase of vulnerability. The vulnerability in DKI Jakarta and JMA is increased by expossing more people, properties and infrastructures in the flood prone and low lying areas.

The demographic change in form of increased population in JMA is influenced by urbanization and large scale development in the past three decades. Between 1980s-2000s, the development in JMA has been led by market development (Hudalah and Firman 2012) which cause large scale rural land conversion, development of gated communities, and new town development in the outskirt of Jakarta. The newtown development in JMA is a response to demand of housing by the high economic growth in Jakarta (Firman 2004). This phenomenon is called "mega-urbanization" by Firman (2009), noted by large scale housing and new-town, infrastructure and industrial estate development. These huge demands for land cause a lot of land conversion. Rustiadi (2007) observed there have been 16,600 ha land use conversion from rural type activities to urban. In less than 15 years there has been an increase of 18% additional built up areas in JMA.

This fast changing is observed by Silver (2008) as the biggest challenge in JMA that the urban environment occurred faster than the plans could guide them. During 30 years since 1970 to 2000, the undeveloped plot of land in Ciliwung Basin decreased drastically. This is

indicated by land use change percentage for agriculture and green open space area, and wet land and water body as well. In 1970, the percentage of land use for the two classes is 66% of total river basin or about 25,687 hectares. However, in 2000, the area of undeveloped land use is only 38% of total river basin or leaving only about 15,079 hectares. The change of land use from agriculture to settlement, commercial and industrial use makes the land surface impervious. This will affect the rise of water flow, stream flow capacity and absorption into the ground. While the rate of population increase in Jakarta is relatively flat, the high number of urban dwellers increase in Bodetabek Region is due to the motivation to work in secondary and tertiary sectors in JMA. High investments in secondary and tertiary attracted many people to move permanently or temporarily to Jakarta. The high investment is due to the capital circulation is concentrated in JMA.

Unfortunately, the new town development did not follow Jakarta City master plan and mostly was carried out and managed by private developers. Therefore, provision of infrastructures is limited to the delivery for every single site. This creates a bottleneck situation in the infrastructure systems, such as transportation and drainage. In term of drainage provision, the municipalities in JMA have difficulties to estimate the water run-off as the impact of the new town development. When there is any problem, each developer comes up with a solution that will give benefit only to its area which will create problems in another area.

The high development in JMA has affected the Ciliwung Watershed, the main watershed in JMA (Figure 2). Some areas in the upstream have been converted into houses, hotels, villa and restaurants that causes higher water run-off. In the case of heavy rain in the upstream, a lot of water will be flowing fast to the downstream. Indeed, the development in the upstream is not coordinated with the impacts that could occur at the downstream. The upstream contribution to the flood in Jakarta is indeed one of the main problems. In term of intervention, this has become a classical inter-governmental problem. Floods in Jakarta are contributed by the high run-off in Bogor. Brinkman et al (2009) explained that only in one day in 2007 flood period, the highest water levels in the downstream Ciliwung (10.61m) happened when upstream Ciliwung River reach the highest level (4.92m).

Some discussions on collaboration between adjacent local governments have long been initiated. However, coordination becomes another classical problems either between agencies as well as between region. Based on Jakarta historical disaster events, only the 1996, 2002, 2007 and 2013 floods belong to the large scale disaster. Jakarta flood in 1996 occurred in all over the city (Table 1). In 2002 and 2007, flood again hit Jakarta and gave worse as well as wider impact than the previous 1996 flood. It was evidenced by the addition offloodinundationareaanda greater particularly in financial impact. Great flood in 2002 had inundated Jakarta and other surrounding areas such as Tangerang and Bekasi. On the other hand thefloodin 2007 occurred and gave an impact in nearly 60% of Jakarta areas, which led to evacuating over 210,000 people there.

In the future, the inundation in Jakarta is very likely to increase by climate change scenario. Measey (2010) noted “the mean sea level in the Jakarta Bay will rise as much as 0.57 centimeters (cm) annually and the land surface will decline as high as 0.8 cm per year”.

Indeed the study by Ward et al (2011) simulated that the inundation area of coastal flood events of 100 and 1000 return period which is not accommodated by the current spatial plan. If this happens, many vulnerable people in Jakarta, especially living in North Jakarta Bay, will suffer a lot. The recent study by Yusuf and Fransisco (2010) indeed has calculated that the North Jakarta will receive a serious problem by climate change in the coming years.

Figure 2 Development of Built Up Areas in Ciliwung Basin

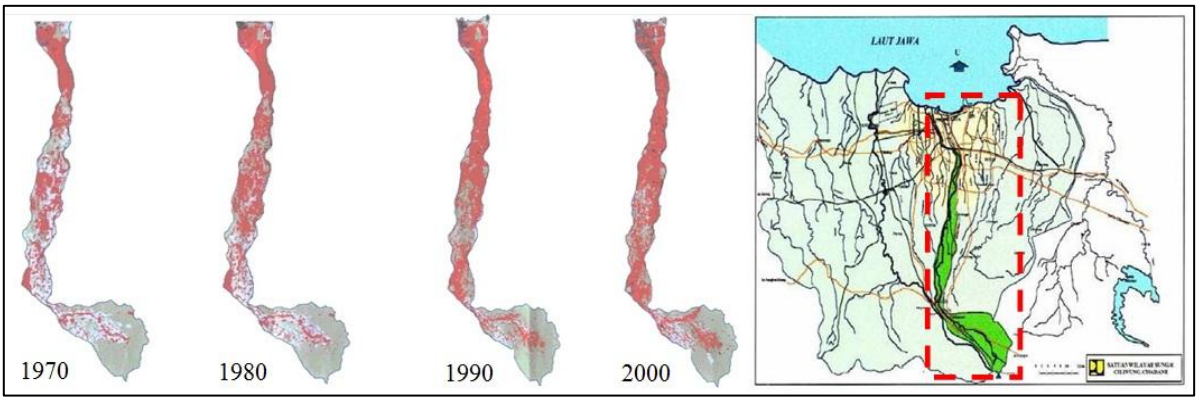

Table 1 Major Floods in Jakarta

Variables	Flood in 1996	Flood in 2002	Flood in 2007	Flood in 2013
Causes	The capacity of river is smaller than the incoming water's runoff. Low stage of river capacity and major canal are caused by the high conversion of area around these rivers and canals into settlement function, sedimentation, and illegal waste disposal	Land useinurban areas which lots of buildings and settlements has led to the decreasing of land absorption ability as well as narrowing the river canal in downstream area.	Beside of poor drainage system, flood was preceded by heavy rainfrom afternoon on Feb 1 to the next day on Feb 2. It was worsened by the high volume of water in 13 rivers in Jakarta which originated from Bogor-Puncak-Cianjur and the tide of Jakarta's sea water. All of those causes result in flood in nearly 60% of Jakarta's area which reached up to 5 m depth at some location.	Flood in Jan 2013 was less intense compared to 2007 but the rainfall was widely distributed upstream and downstream. 17th Jan was considered the worst but it is predicted to be continued and the city should be put on alert level 1 till 27th Jan.
Inundation Area	n/a	330 km2	400 km2	>400km2 (tentative)
Inundation Point	90	160	70	109 (Google crisis map)
Rainfall Intensity	288.7 mm	361.7 mm	401.5 mm (geographically concentrated)	40-125 mm (tentative) (geographically widely distributed)
Evacuee (people)	30 thousand	380 thousand	398 thousand	>100 thousands (tentative)
Dead (people)	10	22	57	15 (tentative)
Losses	> IDR 1 Billion	IDR 1.8 Billion	IDR 8 Billion	To be calculated

Source: Media Indonesia (2007); Texier (2008) and Sagala et al (2011) and Google Crisis Response 20 Jan 2013, Kompas Online 17-19 Jan 2013.

3. Government Policy: Too Much Focus on Structural Measures

Megacity planning should be comprehensive and long term. How long is long term enough? Climate scenarios impact on cities are often made at 50-100 years. While *de-facto* and *de jure* cities planning are often made only at 25 years period. In addition, urban risk planning such as flood risks have been reduced to simply physical infrastructure measures and suffer from lack of future risk imagination. For decades, the government has been dealing with floods by emphasizing more at structural (engineering) measures which proven not enough as exemplified by the January 2013 floods.

Putri and Rahmanti (2010) noted that Jakarta authorities claim that there have been comprehensive efforts to manage flood including incorporation of non technical aspects such as economic, socio-cultural, and governance (see Kompas, 2010), the implementation is still limited. In fact, technical parameters and engineering works are still commonly used by the government as the measure of progress against the problems of floods. Jakarta Government focuses on natural hazard strategies rather than reducing vulnerability. The Jakarta Government opted for two flood cannals (East and West Flood Cannals) that have been a long plan of the Dutch Colonial. Even, the development of the East Flood Cannal (EFC) which was initially started in 1973 but had been delayed for a long time. In fact, in the several revisions of Jakarta Flood Control master plans, the EFC was suggested as one of solutions to control flooding in Eastern Jakarta. Recent publication by Simanjuntak et al (2012) suggested that the reason of delay was lack of political committment by national government. The east flood cannal indeed contributes to reduce the flood hazards. However, this seems to be limited to some areas nearby the cannal.

Figure 3 Canal Normalization in Jakarta (Source unknown - to be added)

The other evidence is shown by the current approach of Jakarta Municipality that opted for building Giant Sea Wall (Jakarta Globe 2012) with the purpose to protect the citizens from sea level rise problems due to climate change impacts. The plan for construction of Giant Sea Wall aims to protect Jakarta City from the threat of sea level rise due to climate change

impacts. The program is initiated through bilateral cooperation between Indonesia and Netherlands. The proposed financial scheme is from the various sources, including National Development Budget and Jakarta Development Budget and loan from international agencies, such as World Bank, Asian Development Bank and IFC (*the International Finance Corporation/* Korporasi Keuangan Internasional). In total, 25.86 billion USD is needed to support the giant wall development. However, the development of giant sea wall seems to be ignoring the social structure and vulnerability of the residents. The reclaimed land after the reclamation will be very expensive and it is only be affordable by high income residents. Thus, this is not addressing the needs of the poor people living in North Jakarta that is prone to sea level rise (Yusuf and Fransisco, 2009).

Some community based organizations have taken action through several measures that cover the issues of raising awareness, understanding of flood impacts, and knowledge on how to take action when flood occurs, identifying vulnerable groups and the assessment of people capacity in dealing with floods. While these have contributed to the non-structural measures, they have not been able to address to the millions of people living in Jakarta. Thus, each individual household tends to carry out action at individual level, rather than a collective action (Sagala and Damayanti, 2010). Household with less capacity will be suffering a lot in this situation.

4. Discussion: Strengthening Capacities in dealing with Flood Issues in Jakarta

The floods that occur in JMA are a result of un-controlled urban growth in the cities and land conversion in the upstream. Upstream areas are seen beyond the authority of Jakarta Municipality, it needs cooperation with other province and districts. The impact from development of upstream area needs to be assessed beforehand since it will significantly affect the properties of the people living at downstream area. As a matter of fact, this has been approached by the establishment of BKSP (Cooperating Agency for JMA Development) jointly established by all the Provincial Governments in 1975. However, the fact shows that BKSP does not have real authorities on the development program implementation in the region (Firman, 2010). Firman et al (2011) noted that currently there has been only an *ad hoc* institution, i.e., BKSP-JMA Furthermore, the BKSP is powerless since it is managed by an executive secretary appointed by the governors for five years in rotation. Firman (2010) observed that the existing three agencies in Jakarta administration whose authorities are related to coping with climate change impacts, namely Board of Regional Development Planning (Bappeda), the Board of Environmental Management (BPLHD) and the Board of Disaster Management, have not yet conducted any risk and vulnerability assessment related to climate change. There may therefore be a lack of capacity to provide the impetus needed to develop a programmatic approach, even though the need for integrative programme management is recognised by local and regional government bodies.

The approach to solve the flood problems therefore tends to be partial. In the City of Jakarta, some gated communities residential areas occupied by upper income have been well protected by building canals and sophisticated drainage systems (Firman 2010). There is still limited approach by the city government to reduce the vulnerability of poor people (Texier, 2008). Greater Jakarta flood problems are beyond technical capacities of hydrological problems. It is a complex problem that needs structural measure, non-structural measure and an integrated approach.

Shi et al (2010) argue "for developing countries, it is extremely important to stress the development and enhancement of integrated risk governance, since the problem sometimes beyond technical". Katsuhama and Grigg (2010) suggest, developing countries need to significantly improve institutional, organizational and individual capacities for flood management systems to deal with flood risk". In fact, institutional setting is one of the basic and classical problems in developing countries. Ward et al (2012) observed although many laws and regulations are in place in Indonesia to deal with flood-related issues, such as the Disaster Management Law of 24/2007, the Water Law of 7/2004 and the Spatial Planning Law of 26/2007 the program and implementation is still limited. In fact, the Central Government through a President Regulation No 54/2008 on spatial planning of JMA, the upper stream areas such as Puncak and Cianjur are included as National Strategic Area (*Kawasan Strategis Nasional*) which needs jointly integrated spatial plan, implementation and monitoring. However, the plan is still far from implementation.

We identify six recommendations for the Jakarta government to consider. *First*, the approach to flood risk management in Jakarta needs to be beyond administrative boundries. Since the source of flood waters can come from upstream areas, such as Bogor and Depok, it is important to deliniate the problem beyond Jakarta City. Thus, the coordination should be carried out with two other provinces: West Java and Banten Provinces, including several municipalities of Bodetabek. While this is often acknowledged by elected officials, it is not clear who should take the responsibility to lead all cities government in one table. Van Alphen and Lodder (2006) observed that Indonesia has adopted the Law 7/2004 that stipulates that river basins should be managed at river basin level (''one river, one plan, one coordinated management''). The current main river flowing to Jakarta is Ciliwung River, flowing from Bogor. This in fact implies that a river basin needs to have. Therefore, a strong institution to coordinate and supervise is needed (Fernandez et al. 2006; Setchell 1995; Talukder 2006; Wenzel et al. 2007).

Second, the government should combine both the structural measures and non-structural measures. The non-structural measures include institutional and governance innovation that may govern flood and disaster preparedness, better planning and comprehensive climate adaptation policy. The structural measures including structural drainage strengthening and the development of East, West Flood Cannals. Other structural measures include the plan to develop Jakarta Giant Wall that imitate the flood protection from North Sea in Rotterdam. However, whether this protection is substantially needed or it is on the purpose of land reclamation which is in favor of high income private users which will create further tension

and gaps among the residents. The failure in integrating non-structural measures also shows that the approach has not incorporated the social capital that encourage and promote community capacity. The inability to identify community capacity will create long term dependency on the already weak government in regards to flood management.

Third, governments tend to focus on extreme events yet fail to include reguler events that can hamper the condition. As argued earlier, Jakarta focuses to the "five year return period" floods rather than to the reguler flooding. The fact that the government plan to build giant sea wall also shows their concern on extreme disasters. Unfortunately, Sagala et al (2011) noted that there have been annual flooding events in several places in Jakarta yet they are failed to receive attention since these areas are generally inhabited by poor people in the society.

Fourth, vulnerability has not been taken into consideration properly. The essence of including vulnerability discussion is to bring equity in the residents (Wisner et al 2004). This aims to reduce the number of communities at risk. While the disaster hit communities at the same time, the influence is not felt the same. Some poor people have to cope with the disaster more difficult as compared to their neighbours. The on-going government approaches that focus at structural measures are in fact in contrast to the school of thought on "vulnerability" that suggests social causes needs social solutions (Blaikie and Brookfield 1987). The current strategies did not take into account the development that creates high urbanization. While urbanization was perceived as not the source of problems, government did not integrate the effort on demography and migration policy with the environmental and disaster problems. Non-structural measures are limited. As highlighted earlier, together with institutional resilience, community resilience is needed in dealing with disaster risks.

Fifth, Grand design for Jakarta 2100. Fundamental reformation in urban planning regimes in Indonesia especially Jakarta is necessary. The Jabodatabek needs a grand design for 50 and 100 years anticipating more 'black swan' and future climate extremes. Climate change scenario are often made at 50-100 years scale. Academic work on scenarios (of people and wealth exposure for cites can also be made at 50-100 years time scale. In the case of tsunamis preparedness in Japan, the Japanese government has started to think in 500-1000 year period for planning. While this very long term vision is possible despite requirements in regular revision of planning, recent findings on cities planning suggest that most developing countries government cannot plan in the long term.

Sixth, Jakarta is a growing port city that may play important roles in the global supply chain. We therefore suggest both the central government and JMA to reduce the vulnerability of the Jakarta's seaports infrastructure. Becker et. al. (2012) recently reveals the mismatch in seaports' capital planning cycle which is often limited to 5-10 years, while existing knowledge suggests that the design lifetime of ports is between 30-50 years. While Indonesian long term regional planning suggest only 25 years timeframe.

Indonesian existing national laws and regulations for flood disaster mitigation are well established. Indonesia has the Disaster Management Law of 24/2007, the Water Law of 7/2004, and the Spatial Planning Law of 26/2007, which are for disaster management, water

resources management including flood management, and land use control respectively. (Katsuhama and Grigg 2010). However, these laws do not provide adequate imagination for 50-100 years planning for a megacity like Jakarta. We believe that Jakarta and the emerging metropolis cities in Indonesia need to have 50-100 years planning scenarios anticipating extreme events. Good practice in port's protection in Japan even suggests that port planning must consider at least a 200-year return period of disasters such as tsunami and earthquakes (Normile 2012).

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