

JAKARTA CITY TEAM

# JAKARTA CITY REPORT

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Information related to Climate Change in Jakarta City

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Paper prepared for the Workshops of Climate Change Vulnerability Assessment and Urban Development Planning for Asian Coastal Cities, Rose Garden Sampran Riverside, Nakorn Pathom, Thailand, 22 – 28 August, 2010

# JAKARTA CITY REPORT

*Jakarta City Report is a review of climate change information status that can be collected and had been understood by the Jakarta team members. This report's aim is to assess the present status of climate change knowledge and research gap of Jakarta. All information that has been put in this report came from secondary data sources and our own experiences in conducting previous research or other works in Jakarta.*

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## **Introduction**

Jakarta as the capital city of Indonesia is vulnerable to environmental change due to its location on the northern coast of Java Island. The metropolitan is the largest city in Indonesia as well as being the capital of the country and the center of business. Due to these characteristics, the city is susceptible to external shocks. Jakarta's environmental condition is also considered far from ideal due to its vulnerability to floods, rising sea water and other natural disasters as well as man-made calamity such as pollution and excessive extraction of ground water. The International Panel on Climate Change (IPCC) listed higher temperatures over land and sea, higher sea level, higher humidity as some of the ten indicators of climate change. A study by Yusuf and Fransisco (2009) listed Jakarta as the most vulnerable city to climate change in Southeast Asia.

Jakarta is also a magnet for people looking for better living conditions. These include poor people who came to Jakarta. Based on the 2008 Poverty data released by BPS, Jakarta still has approximately 400.000 poor population and around 300.000 near poor population which are vulnerable to any external shocks, including environmental change. There are also slum areas in several parts of Jakarta where many of these people reside. To assess whether or not these people are at risk from climate change, one must first obtain information on the environmental conditions of Jakarta.

This report attempts to address the current perceived conditions of climate change in the city of Jakarta as well as the readiness of the local government and its people in coping with the impact of climate change. The report also states some evidence of climate change impact, such as rising sea water and constant flooding. Finally, recommendations on what the local government should be done to cope with climate change.

## **Current perception of climate change related risk**

- **General public**

Most of people in Jakarta recognize that flood disaster not only caused destruction of private and public infrastructure, but also disrupted the fabric of social and economic conditions of the people who calls Jakarta their home. Flood disaster has increased the level of social and economic vulnerability of Jakarta. Most people also believe that the level of stress in Jakarta has increased, especially for the poor or marginalized people who

are often involved in the communal conflict, such as mass brawl between communities in Jakarta. BPS data (based on the Village Potential Survey 2008) listed 8 villages in Jakarta (two in North Jakarta) where communal conflict occurred in the last three years. The recent Tanjung Priok incident which pitted public order officials against locals concerning the removal of a sacred tomb emphasized the ease in which things can easily go out of control and can potentially cause large financial losses within the conflict area. There are also other more natural incidences of disaster such as the dengue outbreak which usually occurs during transition from dry to wet season. Thus, it could be surmised that disaster such as these is the determinant factor for socio-economic vulnerability of the people of Jakarta.

The above opinion is supported by a number of NGO's statements in the mass media, such as EEPSEA, KIARA, IHI, KNTI, and FKNJ who stated that Jakarta is a vulnerable city. Several studies have even suggested that Jakarta is one of the most vulnerable cities. But the question in everyone's mind is whether the main cause of these disasters is natural or human? Perhaps the best answer is both. Nevertheless, there is still no sufficient evidence that can corroborate that statement.

Some research have concluded that these disasters were caused by climate change, such as a study released by the BRKP (Board of Ocean and Fisheries Research, 2010) which concluded that the flood which occurred more and more often in Jakarta coastal area caused by climate change, especially Sea Level Rise (SLR) and High Precipitation. But another study conducted by JEDI (Jakarta Emergency Dredging Initiative, 2008) stressed that other local factors may also have affected the flood, such as land subsidence in several locations and the failure of land use control and infrastructure maintenance.

The project developed a framework to find the decisive causes of, and proper measures against flooding. The main conclusions are:

- (1) successive rainstorm in January and February cause floods in the Jakarta area,
- (2) high sea tides in combination with **subsidence cause** floods in the Northern part of the city, and
- (3) insufficient maintenance of infrastructure aggravates the floods.

(Brinkman, Jan Jaap and Hartman, Marco, 2008)

Thus, when we are talking about the vulnerability, it can be inferred that socio-economic vulnerability has been increased by the disaster risk factors, but the problem now is that which factor is the more dominant factor in increasing the risk of disaster? Climate change factors or the lack of urban management capacity did.

- **City officials and city managers**

Currently, the Jakarta Capital City Government does not have a policy which specifically tailored to climate change. However, they do have policies on disaster mitigation such as, a system of rapid mass transportation system which include the Trans Jakarta bus system and the upcoming MRT system. There is also a policy of conversion from kerosene to gas stove with a target of 2 million residents in Jakarta and 1 million small enterprises. In addition, Jakarta also plans to increase green open space areas to 30 percent in 2030 and reducing carbon emission to around 30 percent.

Perceptions on climate change within the high level Jakarta Capital City Government can be obtained from the news. For instance, the Head of Social Division said that poor citizens are very vulnerable to the impact of climate change. Thus, the Jakarta Government provides Neighborhood Empowerment Program (*Program Nasional Pemberdayaan Masyarakat Kelurahan/PNPM*) to create opportunities for poor people to develop themselves. The policy actually aimed at reducing poverty and not adapting to climate change. Other comments came from the head of Environmental Management Board who stated that several regulations have been implemented such as air quality control, absorption well, and gas emission control and other social activities such as a car free day on Sunday, bio-pore absorption hole, smoke free zone, and river/drainage normalization. The head of city planning has developed a green building policy and tried to implement it to the real estate development in Jakarta, especially for superblock and mix land use development.

Thus, even though it can be surmised that the Jakarta Capital City Government has some mitigation policy for disaster prevention, there are still gaps in which the Jakarta Government still needs to address. One major problem is implementation as well as enforcement. The so-called smoke free zone is not really effective throughout Jakarta due to lack of enforcement. People are still seen smoking in places where there is suppose to be a ban. Another paramount issue is that the Jakarta Government still lacks adaptation policy or program for climate change. Many have argued that climate change is on the horizon and people have no choice but to adapt to the changes. The main problem is that there is difficulty in finding the proper instrument to measure the level of adaptation. It is this issue that opportunity for research can be done to explore the form and mechanism of adaptation policy in micro, mezzo, and macro scale of development.

## Assessment of Climate Risks in Jakarta

Climate risk can be understood as risks that variables in the climate/weather system reach values that affect human life adversely. However, one must distinguished between natural climate change and that caused by indiscriminate human tampering of the environment. Jakarta has experienced a number of natural disasters over the years. The highest number of natural disasters is the flood which appears to occur every year and in almost all the villages in Jakarta. Jakarta also has to deal with rising sea water, particularly in North Jakarta municipality and the Thousand Island district where high tides coupled with growing incidence of rising sea water is a growing concern.

**Table 1. Number of Villages Where Natural Disasters Occurred in Jakarta during the last 3 years by Municipality and Type of Disaster**

Municipality	Flood	Rising Sea Water	Twister	Landslide
Thousand Islands	-	4	3	-
South Jakarta	42	-	-	-
East Jakarta	43	-	1	1
Central Jakarta	27	-	-	-
West Jakarta	37	-	-	-
North Jakarta	29	3	1	-
<b>Total</b>	178	7	5	1

Source: BPS, Podes 2008

A personal view of the sea water level in Ancol Amusement Park is higher than the previous year (2007). Other natural disasters but does occur frequently are twisters or tornadoes and landslides. Jakarta also experienced the after effect of earthquakes quite a number of times during a year. Fortunately, Jakarta is not close to the earthquake fault lines, even though the effect of an earthquake elsewhere in the archipelago can sometimes be felt in the capital. If there are earthquakes in Indonesia that can affect Jakarta, its epicenter is usually too far away from Jakarta to cause any significant damage. Nevertheless, Jakarta is still vulnerable to other natural and manmade disasters as well as other environmental changes.

A study conducted by Yusuf and Fransisco found that Jakarta is the most vulnerable mega city in Southeast Asia to climate change (2009). The report showed that Central and North Jakarta is ranked 1 and 2 of the most vulnerable districts in Southeast Asia. Central Jakarta is most at risk because of incidences of flooding, whereas North Jakarta also experienced flooding caused by rainfall and rise in sea water. Other districts in Jakarta such as East, West and South Jakarta are also on the top list, although Central Jakarta is considered the most adaptive compared to the other districts.

There are several climate risk assessment activities that have reportedly been in Jakarta. Here are several climate risks factors have been assessed:

### **1. Floods caused by Rainfall, Temperature, and Sea Level Rise**

A study conducted by The Center for Sea and Coastal Development at Bandung's Institute of Technology (2007) concluded that the sea water level off the coast of Jakarta increased by 0.8 meter. It was also projected that by 2050 some areas in Jakarta, such as Kosambi, Penjaringan, and Cilincing will be under water if global warming continuous at the current pace. This conclusion seems to be corroborated by a vulnerability assessment of Jakarta and Java Island by Rahmadi et.al (2009), using 2(two) approaches, firstly, by MRI method with Japan Model Scenario for DKI Jakarta Province. Secondly, by PRA method in the neighborhood scale (Kelurahan Kamal Muara). The conclusion is that the sea level rise is projected to inundate most of Central Jakarta and will likely cause a significantly large socio-economic impact. Climate related hazards that frequently occurred in Kamal Muara (Penjaringan Sub-district) are sea level rise, flood caused by sea water or high tide, and climate uncertainty

### **2. Inundation caused by Sea Level Rise and High Tide**

The Coastal Vulnerability Index (CVI) Mapping of Jakarta, Tangerang, Surabaya, Pekalongan, and Bekasi by Board of Ocean and Fisheries Research (2009) using Haessler & Timmer, USGS (2001) has shown that there are 4 (four) sub-districts in Jakarta which experienced flood caused by Sea-Level Rise.

### **3. Heat Stress caused by Urban Heat Island**

A study undertaken by Sobry Efendy (2007) attempted to develop a functional relationship between air temperature and urban green space using Landsat data. It also aims to estimate the contribution of various forcing, namely, urban green space, population density, urban area, and automobile densities to urban heat island. The

result stated that a 50% reduction in urban green space would bring air temperature to rise between 0.4 to 1.8°C and Automobile density is found to be the most important cause of urban heat island in Jakarta.

#### **4. Disease Outbreak and water scarcity caused by Rainfall and Air Quality**

Based on a study by Haryanto (2009), diseases stemming from vehicular emissions and air pollution include acute respiratory infection, bronchial asthma, bronchitis, and eye and skin irritations (Boer et al., 2007) and it has been recorded that the most common disease in northern Jakarta communities is acute upper respiratory tract infection – at 63% of total visits to health care centers (Indriyanti and Pedrique, 2006).

#### **5. Water Scarcity, Air Pollution, and GHG Emissions**

Water scarcity is an additional issue as a result of global and regional climate change in which between 2010 and 2015 the country is predicted to experience a major clean water shortage, and this is expected to occur mainly in urban areas (Boer et al., 2007). Air pollution is proven to be a major environmental hazard to residents in Jakarta, regardless of their socio-economic status. Transportation comprises 27 % of Indonesia's GHG emissions, and traffic congestion is a huge problem in Jakarta (Pelangi, 1999).

In our opinion, the climate risks assessments in Jakarta which are conducted by sectoral government institutions, are mostly in the coastal area, and used the IPCC model and GCM data. The gap that we have here is that there is no linkage or even integration among the sectors' risks assessment. In urban development, we should deliver the interdisciplinary approach to achieve the coherent and appropriate solution. Therefore, we think that the cross cutting risks assessment should be introduced to identify the current and future aggregate climate risks. The aggregate risks will be more useful to create stronger and more effective urban policies for climate change.

Thus, the opportunity to conduct research emphasized comprehensive and integrated climate risk analysis to achieve relative risk index among vulnerable zones. The relative risk index as well as other indicators of climate change are needed by the stakeholders to assess the conditions of areas in Jakarta, and to identify the capabilities of their regions and institutions to be more resilient and adaptive to climate change.



## **Assessment of Social Economic Vulnerability of Jakarta**

The social vulnerability is a term under which the social structure of a community or a society is exposed to shock or stress typically brought about by economic strife, environmental changes, and government policies or even caused by internal events and forces resulting from a combination of factors (SOPAC 2003). In this paper, the impact is from climate or environmental change.

Social vulnerability concerns with the human side of climate change. Treating environmental hazards as merely geological phenomena separates them from the social environment and ignores the human impact (Wisner 2005). Thus, it is important to assess the human side of the environmental change.

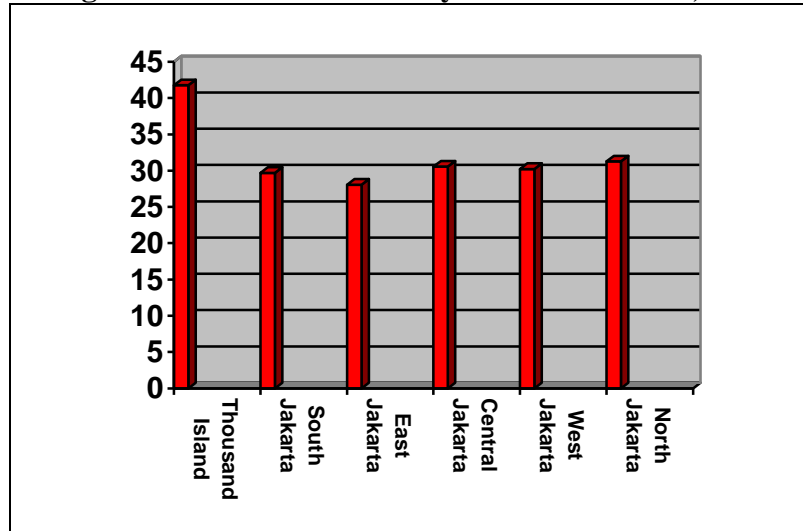
Officially, assessment and mapping on social/economic vulnerability has not been done yet in Indonesia. Most of the vulnerability assessment still focuses on vulnerability to conflict or economic crisis. BPS, as the primary collector of statistical data in Indonesia, has been conducting data collection on vulnerability from the recent global economic crisis. However, BPS has been experimenting on the development of some measures of vulnerability to environmental change. One of those few measures is the so-called social vulnerability index.

The social vulnerability index is one measure to assess the impact of these external forces which include environmental change. BPS has developed an index which assesses the exposure of Indonesian society from social conflict and economic crisis. In terms of social vulnerability to environmental change, some parts of Jakarta can still be considered vulnerable socially. The areas on the northern part of Jakarta, i.e., North Jakarta and Thousand island Municipalities have higher social vulnerability index than other parts of Jakarta.

It means that these areas of Jakarta are the most vulnerable parts of Jakarta. North Jakarta is vulnerable not just from rising sea water, but also flood water from Jakarta's rivers. The thousand Island Municipality is vulnerable to rising sea water as well as polluted water of the Jakarta Bay. Figure 2 below shows that the Thousand Islands municipality has an index of 41.76 which is the highest in Jakarta. North Jakarta came in second with 31.28. East Jakarta has the lowest index (28.07). This means that the higher the index the more vulnerable the

society in the area to environmental change. Whereas, the lower the index the lower the vulnerability of the social order in the area.

**Figure 1. Social Vulnerability Index of Jakarta, 2008**



Source: BPS, Socio-Economic Survey, 2008

Other research that can be identified as vulnerability assessment and coping mechanism related to floods in urban areas is a community based case study in Kampung Melayu Jakarta which is done by Marschiavelli (2008). The Kampung Melayu is where there are slum areas coupled by the fact that they are located on the banks of Ciliwung River, a river known for its tendency to overflow during the wet season. It is also an area with one of the highest concentration of poor and near poor populations (See Figure 1). She tried to explore the vulnerability as well as the capacity for flood management and she found that low-income people are more vulnerable than those in the high-income bracket.

According to our opinion, the social and economic vulnerability assessment still needs to be explored deeper and more comprehensively, especially for micro, mezzo, and macro level. The current activities tend focus more on the physical-nature aspects rather than the socio-economic impact of climate change. Combining both assessments of climate change measurement can resulted in a more comprehensive assessment of the impact of climate change. There is also another side of the climate change spectrum. Current assessment mostly took place in coastal areas where the direct impact of climate change can be seen with the naked eye. Nevertheless, the impact of climate change can also affect other areas outside the ecological boundaries and further inland, as well as in the socio-economic dimension. Indirectly, climate change can have a significant impact on the people. Accordingly, when

assessing the impact of climate change, social and economic impact should also be taken into account to measure vulnerability within the administrative boundaries.

Jakarta needs appropriate method to assess the socio and economic condition which represent the pluralism and income gap among society. Social factor and economic factors should be integrated with the physical vulnerability to find the urban vulnerability assessment. There are a number of indicators which can be constructed using available statistical data in Indonesia. Earlier it is mentioned that Indonesia, through its statistical institution is developing a social vulnerability index to climate change (SOVI). However, the index is still in the experimental stage and needs further development. Other indicators related climate change impact that can be developed or further improved are, among others:

1. Urban Vulnerability Index (UVI)
2. Disaster Risk Index
3. Environmental Vulnerability Index (EVI)
4. Natural disaster vulnerability Indicators.
5. Economic vulnerability.

## **Dissemination of Climate Risks and Vulnerability**

Risk is defined as the product of the three vectors: hazards, vulnerability, and adaptive capacity (Framework adapted from Mehrotra, 2003; Rosenzweig & Hillel, 2008). Currently there is a knowledge gap among the public regarding risk associated with climate change, particularly the difference between climate risk and vulnerability. Communications among the media is used extensively for seminars or public consultations, without using layman's terminology for the general public. Mass media, like TV, radio, and newspaper are not being used to the fullest extent for the dissemination of climate risk or vulnerability. It can be inferred that the issues of climate risks and vulnerability have been circulating within the scientific community, but few, if any, are communicated to the wider public.

The Jakarta Capital City Government sometimes indirectly communicates to the public via its official website, but not in the continuous way. The role of the public figures (artists, Politician, etc) has not been as effective in conveying the message of climate change to the public. Research publication in Indonesia is also very limited and far between. In the other hand, international NGOs that have plenty interest in climate change have only campaigned on a micro level. More importantly, there is no special campaign on climate risk to the people

who are at most risk, such as the poor and marginalized. Thus, there is still a huge gap that has to be filled regarding dissemination of climate risk information among the 11 million people in Jakarta.

The problem with dissemination of climate change has more to do with the method of delivery on climate risks message and the substance of the climate risk and vulnerability itself. Who are the target group? In what way they should know and be engaged with climate issues? What are the direct benefits if they are involved in the climate adaptation or mitigation? Thus, public awareness is one of the key issues of climate change campaign.

### **Urban GIS Information Base**

Jakarta has spatial information which is located in several agencies, not only at the provincial level, but also at national level. In national level, in the scale of map 1:50.000, it is managed by *Bakosurtanal*, while in Jakarta level, in the scale of map 1:15.000 to 1:1.000, it is managed by Department of Spatial Planning.

There are two source data of GIS Information base in Jakarta level. First is aerial photography (including satellite images) in the scale of map 1:5.000 and second is topographical maps (based on survey) in the scale of map 1:1.000.

The GIS is mainly used for urban planning (creating land use map), unfortunately it is not integrated yet with the other social and economic data in one system. Therefore, it's not easy to superimpose the map with other information to allow spatial or intersectional analysis. There is also a lack of information in terms of types and depth of scale related to climate change which is available in Jakarta. The lack of available data also makes it difficult to conduct any meaningful assessment of the climactic conditions in Jakarta, such as long time series data on rainfall, baseline data on tides, the daily measurement of temperatures, etc. Data is available in several government institutions, such as BPS or the Meteorological and Geo-physical Board (BMG). However, there is an urgent need to enrich the data specific to climate change as well as to unify the data to make them more comprehensive.

Therefore, there are a lot of efforts that must be done in relations to preparing Jakarta for the imminent impact of climate change. There is a need to collect baseline information on factors related to climate change and constructing appropriate indicators to assess the impact of

climate change. There are also plenty of opportunities to conduct research stemming from the availability of the data in providing GIS information base to support adaptation policy, such as defining the need of data/information and the appropriate systems application to support the information. Fortunately, in year 2010, Department of Spatial Planning is going to collect GIS data using LIDAR (Light Detection and Ranging) technology. Hopefully, the data can be used for climate risk and vulnerability assessment.

## **Institutional Pattern**

There are no particular agencies or institution in Jakarta which oversees account risk and vulnerability assessments, managing climate change knowledge, or disseminating the climate related information to the general public. Moreover, there appears to be a lack of coordination or accommodation among stakeholders on effective and sufficient media coverage, such as communication forum or social network. There is also no road map about adaptation or mitigation program. Thus, it appears that most government agencies, NGOs, and the private sector conduct their own activities to cope with climate change without coordinating with each other.

Jakarta Capital City Government has several agencies which oversee climate change related activities, especially for risks and vulnerability assessments such as:

1. Board of Environmental Management (BPLHD)

The institution under the current name was established in 2001 based on Local Provision Number 3 2001. It is formerly known as the Environmental Impact Control Board or BAPEDAL. Its mission is to develop professionalism in managing the environment; to develop and strengthen the institutional capacity, as well as to improve to quantity and quality of equipments and infrastructure, and; to develop an environmental information system to support to the establishment of cooperation, supervision, monitoring, evaluation, assessment, research and development of environmental management.

2. Board of Regional Development Planning (BAPPEDA)

This board has put the climate change issues in the Jakarta Mid-Term Development Plan (RPJMD) 2010-2020 and has also put the risk and hazard assessment in the making of urban structure and land use plan in the General Spatial Plan (2010-2030), even though it is not so specific.

3. Provincial Coordinating Unit for Disaster and Refugee Management (Satkorlak PB)

This institution's function is to conduct disaster risk reduction, handling evacuees, and recovery. However, their main task is to focus on providing search and rescue equipment, mitigation procedure, and post disaster mechanism, not many research activities in pre disaster analysis or disaster risk assessment.

The interesting to note that most of the mitigation or adaptation efforts both in research and action programs are being done by the central government through the National Council of Climate Change (DNPI) and related Ministries in which the action plan of climate change is a national Priority. The Jakarta Government staffs are involved in the program only if Jakarta became one of the study locations and their involvement is restricted to being informants and/or participants.

Thus, there is a knowledge gap among city level officials on climate change adaptation compare to officials at national level. Jakarta city officials are aware of the impact of climate change, but still needs knowledge on coping strategies to climate change. Their knowledge about climate hazard, climate vulnerability, climate risks, and climate resilience need to be enhanced by providing them with the technical skills necessary to assess the vulnerability and risk of climate change.

The NGO that has done several activities related to climate change in Jakarta is ESSEA (Economy and Environment Program for Southeast Asia) which is funded by IDRC. ESSEA stated that 5 (five) administrative city of Jakarta has been categorized in 10 ASEAN vulnerable cities, but we have no detail information about this research methodology. In general, as far as we know, we can say that mostly NGO in Jakarta did the mitigation side, such as reducing carbon emission from motor vehicle and waste/garbage (KPBB). So, the gap is even Jakarta is stated as the most vulnerable city in ASEAN, but there is still rare the research about climate risk and resilience indicators of Jakarta itself.

Academic institution in Jakarta, such as UI and ITB has already initiated their research in climate change. Several researchers and graduate students have done the research about climate change and they usually publish the result in the limited media which is the journal/bulletin. But, mostly their concern is in climate modeling and the impact to the sectors, such as health, agriculture, and fisheries. Not many researchers yet have paid attention in incorporating the climate risks factor in the spatial or development planning. So,

the research gap is too many efforts in the climate change hazard modeling, but still limited in the risk analysis and urban adaptation strategy.

We have limited information on business activities related to climate change adaptation, but it appears that the developers in North Coastal Jakarta, such as BP Ancol and PIK has anticipated the flood disaster by building canals or well-designed drainage. However, there is little information on civic housing and settlement in the coastal area of Jakarta. In our understanding, the climate-disaster risk has only been considered by the big enterprise, but not in the middle-low income people. They tend to use their own perception about the disaster risk and prepare themselves separately to cope with climate change on their own. So, there is still gap in the city wide scale of institutional pattern of climate change adaptation.

## **Urban Spatial Plan**

Jakarta already has a provincial regulation concerning General Spatial Plan 2000-2010, but now it is in the legislation process for revision. It is estimated that in the revision will be completed in the last month of the 2010, and the new provincial regulation concerning General Spatial Plan will be established. The planning process of this spatial plan appears to include hazard analysis of Jakarta, such as flood, sinking, inundation, and fire hazard. There will also be a map of disaster hazards of Jakarta. However, the map will not explain climate vulnerability level, much less the future climate risk level.

Jakarta has also the detailed spatial plan (RDTR) which plans the land use for every district in Jakarta. RDTR regulates the intensity and density of each land use that has been planned in the general spatial plan. The recent provincial regulation of the RDTR is made in 1997, so if the amendment of general spatial plan would be completed in December 2010, then there will be a spatial planning process for detailed spatial plan in the next year. So, it is the opportunity for us to incorporate the climate hazard and risk assessment to the detailed spatial plan.

The other detailed spatial plan which is made for north coastal Jakarta is about the reclamation plan. The reclamation plan is now being revised due to environmental reason. Related to climate change factors, such as sea level rise and land subsidence, the reclamation should be made properly. The climate risk assessment can be introduced as a tool for environmental feasibility for reclamation plan.

## **Building Codes, Zoning Regulations, Sanitation Codes Enforcement**

The City of Jakarta is serious in contributing for lower carbon emission. The Government has established the working group of GHG emissions, which is focused on the intensification of mass rapid transportation, green building regulation, safe energy for office building, and free smoking area. But, the green building code itself is not completed yet. Additionally, enforcement needs to be strengthened if the regulations want to be properly imposed.

Zoning Regulation is relative new in Indonesia since the law of spatial management (UU 26/2007) was implemented. The zoning regulation is one of the spatial development control instruments in Indonesia. So, it's very much required for the coastal area, especially for the hazard prone area. The Jakarta Government is still working on the zoning regulation formulation. So, there is a big opportunity to incorporate the climate risk assessment to those regulations.

## **Early Warning System**

Government of Jakarta has used the teleconference technology to monitor the government official preparation and built the automatic weather station (AWS) which functions as an early warning system of flood disaster, especially the water flow from the catchment area through the main river network. This AWS is in coordination of Provincial Coordinating Unit for Disaster and Refugee Management (*Satkorlak PB*) with the information section of Board of Meteorology, Climatology, and Geophysics and Hidro-oceanography Naval Army, and other official as well.

The process of early warning system is done by monitoring the level of water in every flood control gates. If the level of water is in danger level, then the information will be delivered by the task force in every sub-district to alert community in the hazard area.

Nonetheless, Jakarta has maintained a number of disaster response plans, except for earthquake. An official from the Jakarta Governor's office has stated recently that Jakarta has no disaster response plan to deal with earthquakes, although there are efforts to identify a number of risks associated with this type of disaster (Jakarta Post, 2010, P. 18 Saturday July 17, 2010). The existing disaster response covers flooding, fire and epidemics, such as dengue fever and bird flu.



Based on the *Podes* 2008 data from BPS, Jakarta has several disaster response schemes. They are, an early warning system, safety advisory, community self help, and safety equipments. Jakarta has only one early warning system in the Thousand Island Sub-district presumably for tsunami warning. In terms of safety equipments, there are 177 villages that have these disaster response measures. There are 145 villages that have safety advisory. And there are also 234 villages which have their own safety measures (self help).

In our opinion, this EWS has focused on the flood which is caused by the high volume of rainfall, not really handle the flood problem which may be caused by the sea level rise.

## **Public Funding and Commitment**

There is currently no information on public funding and commitment on climate change. However, based on the Jakarta City Government Medium Term Development Plan for 2007-2012, some sort of funding must be available and there should also be commitment. Even though the development plan does not specifically state climate change, the Local Provision No. 8, 2008 on the Medium Term Development Plan, placed the environment as one of the priorities of the Jakarta City development. The medium term plan also shows commitments, at least on paper, by the Jakarta City Government to take into account the changing environment. The plan also shows that the local government is aware of the problem of environmental damage due to increasing population, limited land and continuous development. They are also appears to be aware of the damage to the environment, such as air pollution, water pollution as well as the pollution caused by the management of garbage which is not optimum. The plan also stated constraints faced by the local government, and, more importantly, efforts to tackle the problems, including clean water, air and sea water programs. Therefore, it can be surmised that there should be budget allocation for these efforts.

## **Governance and Social Justice**

### Governance: emergence of non-formal institutional

Since the reform era (2001), many non formal organizations have been born in Jakarta and strived for their regime in strategic location of Jakarta. Most of them are civil society organizations which are built based on the ethnicity and religion or belief of group of people.

The role of these groups sometimes is more powerful than the formal institution, such as sub district governments and/or police institutions. This transition of governance pattern in Jakarta needs to be considered in appropriate way, especially in proposing climate governance established in the society.

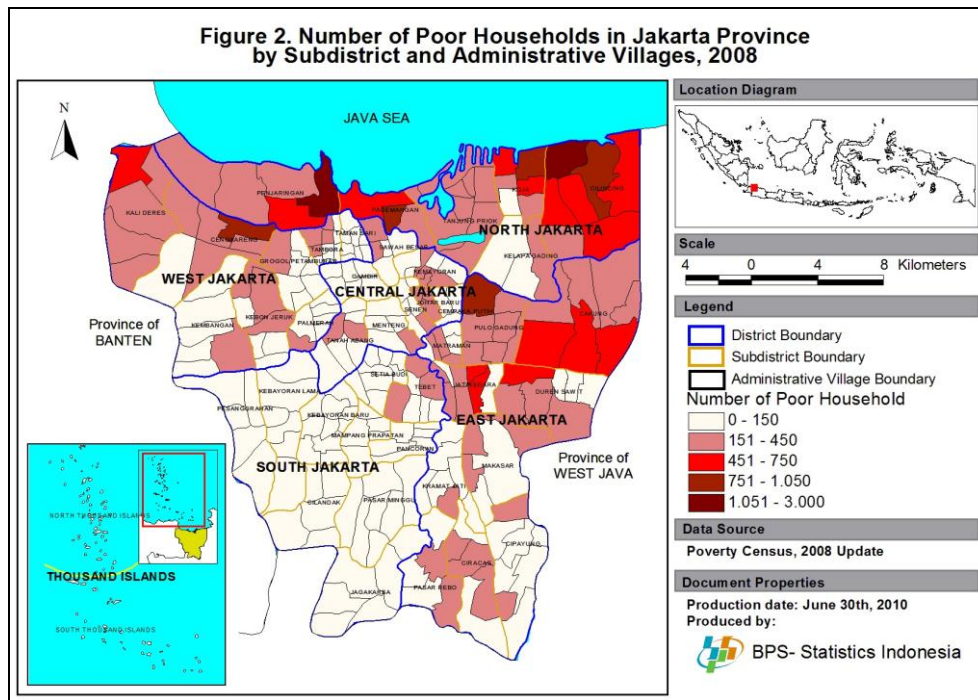
Economic issues (people's welfare) and environmental issues (people's security) sometimes have been conflicted in order to find the priority of development program. And until now, there is no sufficient tool and methodology to assess the objectivity in program prioritizing. So, it's still a big gap to address or to mainstream the climate-risk factors in the level of community in the term of climate governance.

### Social Justice: Poor people

It is arguable that the poor in Indonesia is the group most vulnerable to the adverse impact of climate change. Indonesia still has a significant number of poor. Based on the figures produced by BPS-Statistics Indonesia in 2010, the number of poor in Indonesia stood at 31.02 million people or 13.33 percent of the whole population. The majority of poor are in rural areas and live in the eastern parts of Indonesia. Jakarta, as the capital of the country, still has a significant number of poor. Based on the 2010 figure, the number of poor in Jakarta is still more than 300,000 people or about 3.5 percent of the population.

These groups are vulnerable of becoming even poorer if there are some radical changes in the environment where they live. The problem for these people is that if there is an environmental change, such as flood or rising sea water, they have nowhere else to go. Thus, they must face the full brunt of the environmental shocks which may negatively affect the social cohesion of the group.

Figure 1 below shows the number of poor households in the Jakarta Area. As can be seen in the figure, the poor in Jakarta are concentrated mainly in the North and Eastern parts of Jakarta. There are two villages with the highest concentration of poor households which are located in North Coastal Jakarta, which are Kalibaru *Kelurahan* in the Cilincing Sub-district and Penjaringan *Kelurahan* in the Penjaringan Sub-district. Penjaringan is one of the villages in North Jakarta which experienced the worst flooding in 2007 and subsequent flooding due to the rise in sea water (Susandi, 2009).



The two villages not only have highest concentration of poor people, but also near poor people who are vulnerable to becoming poor if there is an external shock such as natural or non-natural disaster. The two villages are also prone to rising sea water. These poor and near poor households are vulnerable to changes in the sea water level. If there is global warming which causes rising sea level, these poor households will be the first to suffer.

## Others

As with many large metropolitan cities, Jakarta also has a high degree of environmental pollution. In addition to air pollution, Jakarta also has polluted water, polluted soil as well as noise pollution. Based on the Podes 2008, there are 62 villages in the Jakarta area which experienced air pollution. There are 42 areas that have noise pollution and 24 villages with high polluted water. Only 3 villages experience high degree of soil pollution.

**Table 2. Number of Villages Where Pollution Occurred in Jakarta by Municipality and Type of Pollution (2008)**

Municipality	Water Pollution	Air Pollution	Land/Soil Pollution	Noise Pollution
<i>Kepulauan Seribu</i>	1	4	-	1
South Jakarta	6	6	-	13
East Jakarta	15	9	2	7
Central Jakarta	18	2	-	12
West Jakarta	8	7	1	9
North Jakarta	14	-	-	-
<b>Total</b>	62	24	3	42

Source: BPS, *Podes* 2008

In addition to these types of pollution, due to the uncontrolled extraction of fresh groundwater, some freshwater in the north part of Jakarta are mixed with sea water making it unfit for drinking. Furthermore, due to the extraction and uncontrolled development, there is some evidence that Jakarta is sinking slowly. Some have predicted that Jakarta is sinking by an average of 10 cm to 12 cm a year (www.brudirect.com, 24 April 2010; ABC News, April 15, 2008; Brinkman and Hartman, 2008). However, there is no clear evidence that climate change or global warming is the cause of the rising sea level. It maybe due to the sinking of Jakarta or might also is caused by global warming, or a combination of both factors. One thing is certain; Jakarta must have an adaptive plan to cope with the imminence of climate change.

## CONCLUSION

The City of Jakarta does not have concrete steps to tackle the problem of climate change. Current endeavors by the Jakarta City Government tend to focus more on disaster management, rather than efforts to specifically tackle the impact of climate change. The government has placed early warning systems and mitigation programs to cope with disasters, such as flood and rise in sea water. However, these efforts are more of reactive measures rather than proactive measures to tackle the problem of climate change. In

particular, the local government must be able to obtain knowledge on how to adapt to the changes.

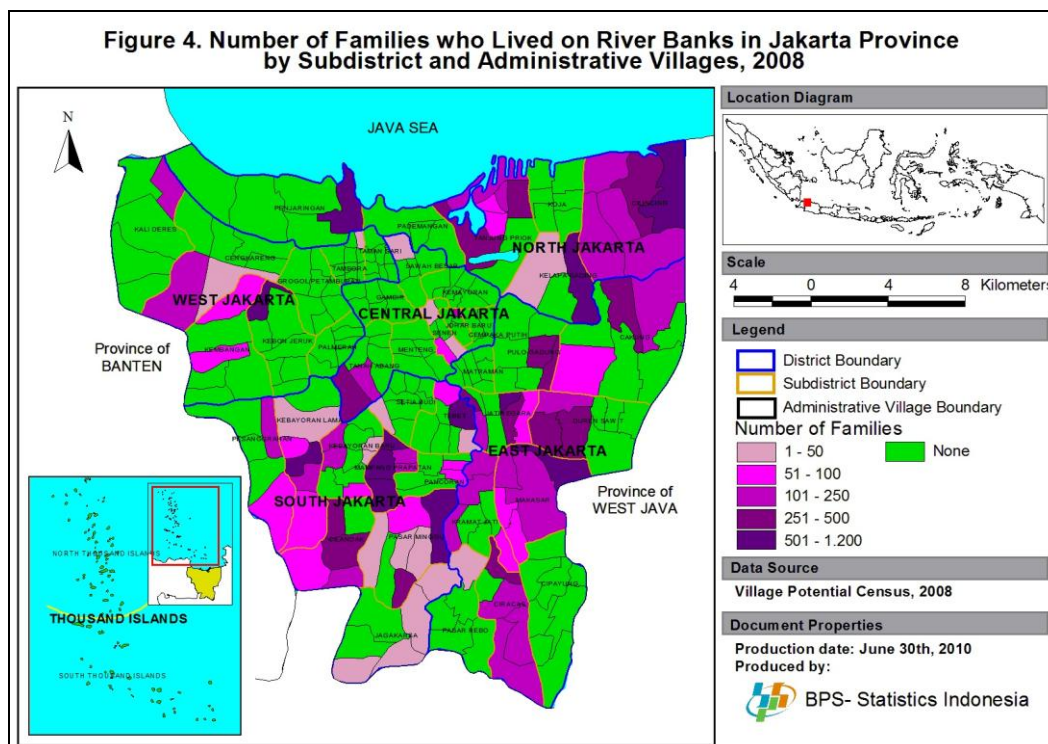
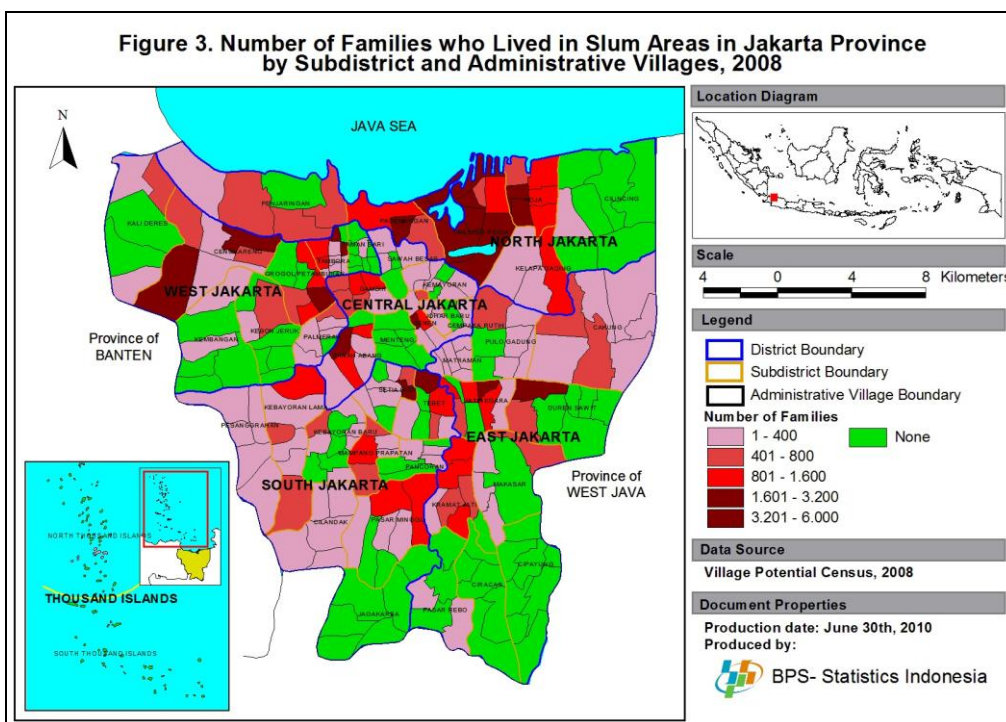
The lack of response from the local government may not be entirely their fault. Studies on climate change in Jakarta are sorely lacking, and those that do could not conclude whether the events related to the environment is irrefutably caused by climate change. There is also a lack of available baseline data on factors related to climate change, such as air temperature, rising sea water as well as the social impact of climate change. Commitment by local officials appears to be lacking, despite all the political rhetoric and promises. Finally, there is still a lack of knowledge on what climate change really is, not to mention the coping mechanism which the local government has to master in adapting to climate change.

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## APPENDIX



**Figure 5. Areas (Villages) where Communal Conflict Occurs within Last Year in Jakarta Province, 2008**

