Hydrodynamic modelling for flood reduction and climate resilient infrastructure development pathways in Jakarta

Report of Policy Note:
Summary Document on Presentation on Final Recommendation to Relevant Policy Maker and Stakeholders
This report has been prepared under the DHI Business Management System certified by DNV to comply with ISO 9001 (Quality Management), ISO 14001 (Environmental Management), OHSAS 18001 (Health and Safety Management)
Hydrodynamic modelling for flood reduction and climate resilient infrastructure development pathways in Jakarta

Report of Policy Note

Prepared for CTCN - UNEP
Represented by Ms. Sandra Bry

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<thead>
<tr>
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<th>Dr. Budy Wiryawan</th>
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## ABBREVIATION

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<tr>
<td>CTCN</td>
<td>Climate Technology Centre and Network</td>
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<tr>
<td>DKI Jakarta</td>
<td>Daerah Khusus Ibukota Jakarta (Provincial Government of Jakarta)</td>
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<td>GSW</td>
<td>Giant Sea Wall</td>
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<td>SKPD</td>
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1 INTRODUCTION

1.1 Background

Land subsidence, sea level rise, and increasing precipitation will increase river flood risk in Jakarta from 2015 to 2030 by 180%, of which land subsidence alone contributes by 126% (Budiyono, Aerts, Brinkman, Marfai, & Ward, 2015). Land subsidence will continue in the coming years even after groundwater extraction is stopped (Bakr, 2015). The most significant land subsidence during 1997-2005 occurred in North West part of Jakarta (Abidin, Andreas, Djaja, Darmawan, & Gamal, 2008). Abidin et al. (2011) showed that the rate in land subsidence from 2007 to 2010, at three stations located in North Jakarta varied between 11 and 19 cm/year. Between 1992 and 2009, sea level rise in coastal Jakarta reached 2-4 mm/year (Fenoglio-Marc et al., 2012).

At the macro level, BAPPENAS (2007) estimated the economic losses due to major flooding in 2007 were 5.16 trillion IDR. At the micro level, economic losses due to the January 2013 flood event were 2.99 million IDR per household and 7.85 million IDR per business unit (Wijayanti, Zhu, Hellegers, Budiyono, & van Ierland, 2017).

Jakarta Provincial Government has implemented various flood mitigation and adaptation measures to reduce the adverse effects of flooding. These include dredging, cleaning and widening the river (known as normalization program), increasing the capacity of the pumps, and improving river and sea dykes. Further adaptation measures under consideration include the constructing of a giant sea wall and the establishment of two upstream reservoirs in Ciliwung catchment. Additional measures are required that take into account impact of climate change and land use changes in the areas around Jakarta (Bodetabek - Bogor, Depok, Tangerang and Bekasi). A study is required to consider hydrodynamic as well as socioeconomic characteristics with the view of tailoring additional adaptation and mitigation measures aligned to government budgets, also to be used as an alternative strategy to develop existing polder system in the onshore area.

1.2 The CTCN Project

The Climate Change Technology Centre and Network (CTCN) is the operational arm of the United Nations Framework Convention on Climate Change (UNFCC) with the mandate to promote the accelerated transfer of environmentally sound technologies for low carbon and climate resilient development at the request of developing countries. Based on such requests the CTCN provides technology solutions, capacity building and technical advice on policy, legal and regulatory frameworks tailored to the needs of individual countries and based on specific country requests submitted by a National Designated Entity (NDE).

The Provincial Government of Jakarta (DKI Jakarta), Indonesia, through Jakarta Research Council (JRC) requested support from the CTCN to develop a hydrodynamic model for flood reduction and climate resilient infrastructure development pathways in Jakarta. The technical assistance offered through CTCN aims at enhancing the capacity of relevant local government agencies to address a number of flood related issues.
The objectives of CTCN technical assistance are to better assess flood risks and hazards, and design climate-resilient pathways to reduce the magnitude and scale of the impacts from the flooding.

More specifically the short-term objectives of the technical assistance include:

- To develop a high-resolution hydrodynamic model for a pilot project area in Jakarta that is capable of producing flood levels under differing climate and/or engineering scenarios.
- To carry out a socio-cultural survey to capture the views of the local resident within the pilot project area to the risks of flooding along with adaptation and mitigation options to alleviate these risks.
- Through a period of technology transfer, including data transfer and training, the model is to be made available to relevant agencies in Jakarta. Specific aspects of the technology transfer will include flood modelling and hazard mapping.
- A series of recommendations aimed at local authorities to reduce flood risks. These will be obtained through expert-led workshops incorporating results from the project along with views of relevant stakeholders. These recommendations will allow local authorities to take the findings from the project into account when formulating plans to provide a sustainable future for the area.
- To initialize future funding opportunities to further expand the utilization of the hydrodynamic model, e.g. to extend the spatial limits to incorporate all flood risk areas in and around Jakarta, or to incorporate additional components within the model.

The technical assistance activity has five stages:

1. Develop a high-resolution hydrodynamic model at a pilot project site capable of describing changes to climate change issues and/or infrastructure scenarios in Jakarta. The hydrodynamic modelling is described in the “Hydrodynamic Flood Modelling Summary Report”.
2. Identify socio-economic conditions to determine the response of communities at pilot project sites to selected adaptations to reduce flood risk. The socio-economic conditions are described in the “Socio-economic Risk Assessment Report”.
3. Capacity building of local partners in high-resolution hydrodynamic studies through information exchange, technical training and capacity building. The capacity building of local partners is described in the “Training Summary Report”.
4. Formulate recommendations for users in reducing flood risk, through strategic policy of hydrological infrastructure development and area arrangement. This recommendation also considers sustainability issues of selected areas in the future. Policy considerations are provided in the current “Policy Note”.
5. Pioneered further funding opportunities to develop hydrodynamic models and sustainability of activities. Actions to pursue policy recommendations will be outlined and discussed with potential funding entities. Section 7 outlines a sequence of further actions.

1.3 The Policy Note

Policy recommendations have been developed through the following process:

- Assessments from hydrodynamic modelling of flooding scenarios for a pilot project area in northern Jakarta. Recommendations arising from these are presented in Section 2.
- Socio-economic studies at the pilot project area. Requirements identified from these are presented in Section 3.
• Experience from capacity building
• Feedback during various workshops throughout the project. These have included the first stakeholder workshop in July 2016, series of MIKE HYDRO and MIKE FLOOD training workshops between October 2016 and April 2017 and an expert meeting in April 2017.
• A stakeholder policy workshop in May 2017, where recommendations were discussed and feedback provided. Policy considerations arising from this workshop are summarised in Section 6.
• Further actions include a consolidation of policy recommendation into fundable actions. Section 7 gives a short overview of the process, which involves dialogues with potential funding sources and a funding workshop

Policy aspects shall be incorporated in the final report over CTCN Technical assistance.
2 Hydrodynamic study

For details on the hydrodynamic modelling reference are made to the “Hydrodynamic Flood Modelling Summary Report”.

The overall long-term adaptation recommendation from modelling in the pilot area is to adopt a hydrological and open space approach to revitalize Jakarta as a blue green metropolis\(^1\) taking into account environmental, economic and social concerns. The modelling that has been undertaken at the pilot area underpins that applying this approach in developing adaptive areas against hydrological disasters can be done while pursuing enhancement of regional economic performance.

The solution implies:

- Development of a hydrologic solution/infrastructure based on retention ponds
- Resettling in higher rise buildings thus allowing population to stay in local area
- Infrastructure to adhere to the concept of blue-green metropolis

In the pilot area, there are three options for polder system management:

1. Maintain separate management of the three polders towards a single retention basin or two basins near Cengkareng drain and Angke Muara. The choice between one or two basins to be based on both hydrological and aesthetic considerations.
2. Unify the management of Kapuk polder and Kapuk Poglar polders (government management) and maintain the private management of Pantai Indah Kapuk 8 polder. Such separated management calls for strengthened regulations to ensure that there is no effluent overflow between the private and government polder systems.
3. Unify the management of all three polders. Such a solution requires coordination through strengthened public-private partnership.

Option 3 is preferred from a hydrodynamic point of view

A one-polder system requires the drainage system to be designed to accommodate 25-year flood events. Socio-economic studies show that the existing drainage system does not meet this requirement and Ministry Public Work Regulation standards are not met. The drainage system needs to be redesigned/upgraded to handle the quick drainage of 25-year floods into retention pond(s).

The flood experienced in 2007 was a 50-year event. It is recommended that the retention pond system (volume and polder embankment) and associated drainage be designed for a 50 (or 100) year recurrence event. There is a need to make additional model runs for these recurrence situations.

Amendments should be made to existing regulation:

1. Building codes should be adjusted for the flood recurrence for example with respect to location of electrical system (first floor). Places of worship should be designed as refuge centres in cases of flood, possibly adding an additional floor 3 meter above ground.

\(^1\) The Blue Green Jakarta is the winning proposal in the Green Metropolis Jakarta 2050 competition. A retention pond is planned to be located in Kapuk Polder system (study area), because this area is continuously flooded, notably in 2007 and 2013. The area is also affected by land subsidence. This retention pond is a proposed measure in reducing the flood by diverting the flood into the pond.
2. The condition/quality of polder embankments should be supervised systematically.
3. Retention pond and pumping systems need to be reconsidered and regulated based on hydrodynamic modelling.
4. Flood preparedness needs to be strengthened (broadcasting, evacuation procedures, education/awareness/capacity building) also taking into account recurrence events exceeding 100 years.
3 Socioeconomic study

For details on the socio-economic conditions in the pilot area reference are made to the “Socio-economic Risk Assessment Report”

A blue-green metropolis approach encompassing distributed retention ponds will change the population distribution pattern and relocation of people into higher rise settlements is required. This implies:

1. Provision of alternative higher rise housing for relocated people. Preparatory recommendations are:
   - Increase awareness among local communities on flood mitigation and adaptation. Such awareness-raising will benefit from the involvement of key-persons from the community (leaders). Community awareness-raising should be initiated as early as possible and continued throughout the transformation process.
   - Ensure that the design of new residences takes into consideration the culture and needs of the relocated population. Requires in depth understanding of their current situation.
   - Address the implications of economic activities (household livelihoods) related to transport to minimise burden on relocated population.
   - Establish strong coordination between stakeholders in the transformation/relocation process (including Public works, Office of Water Management, Office of Housing and Building and down to community levels). A coordination platform/arrangement should be established to manage and monitor the transformation process.

2. For improving community’s economy, preparatory recommendations are:
   - Capacity building of the relocated community targeting household economy adjustments/improvements (develop alternatives to prior economy consistent with new settlement).
4 Training workshops

For details on the training workshops reference are made to the “Training and Workshop Summary Report”.

Through a period of technology transfer of this project, series of trainings have been conducted to increase capacity building of local stakeholders to further develop the designed model with a wider range of scenarios. In addition, workshops have been conducted five times. The first workshop was aimed to socialize and gain the same perception among related stakeholders regarding the objective of this project. Then the last workshops were aimed to enhance the capacity building.

The relevant observations arise both technically and/or from socially perspective:

1. The time step and cross section of the designed model should aim to present the reality condition. The time step should be not too coarse, and the cross section in a chain must be adjusted to the cross section at upstream and downstream chain.
2. According to the discussion during the training, the time-frame of data collection should consider the data availability in the field. In this project, the data collection took longer time than it is expected due to the required data were still in the manual script and not complete. Thus, it hampers the process of hydrodynamic modelling.
3. A matrix about the relationship between all Local Government Work Unit (SKPD) and/or related stakeholders regarding flood and water management could be made to help integrate all related stakeholder processes.
4. Improving quality of infrastructure. Recommendations include:
   - Reduce groundwater exploitation and thereby reducing/arresting subsidence. It is required to identify replacement sources and establish distribution/supply system\(^2\).
   - Improve drainage infrastructure (also mentioned under hydrodynamics above).

\(^2\)Such systems could be distributed decentralized water treatment plants using surface water from clusters of retention ponds.
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5 Policy Workshop


Attached to the call for the workshop was a brief on the CTCN capacity building and the findings from the hydrodynamic modelling (Section 2 above) and the socioeconomic study (Section 3 above).

The objective of the workshop was to inform stakeholders in pilot area about the policy outcomes from the CTCN assistance and provide opportunity to give feedback.

Material for the workshop includes:

- Annex A: The workshop programme
- Annex B: The participants in the workshop
- Annex D: Slides presented during the workshop

Following the presentations, the participants were separated into two groups to discuss hydrology and flood infrastructure aspects (Group 1) and socio-economic aspects (Group 2).

Group 1 concluded:

1. Flood risk map must be produced as basis for decision support system
2. There is a need to harmonize existing regulations affecting polder system
3. Coordination between local and central government must be strengthened
4. Public-private partnership is required to tackle flood issues in Jakarta

Group 2 concluded:

1. The statement “resilience is an opportunity” could be translated to the action level (not only physics, but also social, environment, and take into consideration climate change effect)
2. The outcome and recommendation should be included to the Jakarta Mid-Term Development Plan (RPJMD).
3. There is a need to examine different scenarios (physical, social, economy, and environment) in the targeted location. These could include:
   - Business as usual scenario
   - Survival scenario
   - Transformative scenario
4. Jakarta has experience with relocation of communities, however, they only focused on physical aspect. Thus, it is recommended that:
   - Relocation should consider the community up to household level, not only as one big group
   - Relocation need to take into consideration micro economic activities in a relocated area
   - Livelihood design for the communities
   - Coordination and collaboration among stakeholders
   - Preparation and socialisation to the community about further planning is required
The discussion among member of group 2 also raises the suggestion that recommendations from this project should be considered and aligned with the vision, missions, and programs of the newly elected governor of Jakarta.

In absence one of the invited experts gave her inputs by email (which also has summarised in the points below) on relocating the community in the targeted area to the higher rise settlement. To revitalize the targeted area for creating blue-green metropolis, many preparations are required for the affected community by taking into consideration that should be done as follow:

- Relocation should use a participatory approach.
- Settlement in a high-rise location are needed for the affected communities. To implement this, socialisation or improving community's awareness, identification of the potential tenant's characters, and coordination among the stakeholders are required. The community should be invited from the beginning of the process. They also need to changes/adjust living habits to new location
- A study about moving pattern of the community regarding their economic activity is needed to decide the optimum location in community relocation
- After relocation process, activities to strengthen the community’s economy and determine Basic Improvement District (BID) area is required to empower the affected community.
- Coordination among the stakeholders could be strengthened by creating a forum or consortium to coordinate each unit in the government of Jakarta. This forum would serve as a cooperation place. With this forum, the implementation process of the big concept of revitalization could be controlled.
6 Consolidated policy considerations

Whereas valuable outputs and recommendations have been produced under the technical assistance from CTCN a series of additional activities are required.

1. Need for further capacity building
   - Access to model software. The license for the software applied in the capacity building will expire and arrangements are required to ensure continuous access for the institutions that have been targeted by the CTCN support. Additional licenses will be required if the capacity building target is expanded.
   - Training in a learning by doing process related to consolidated and expanded modelling (see below).
   - Training of other Indonesian stakeholders

2. Project value addition opportunities
   - Experience dissemination in the region (Bangkok/Jakarta seminar on experience from this case to share with urban management from coastal cities experiencing similar problems in the region)
   - Experience dissemination among Indonesian stakeholders

3. Need for consolidated modelling
   - Related to project area: 50 year, 100 year scenarios, design and location of retention ponds (retention pond zonation allowing for certain activities in area between 50 and 100-year event)
   - Related to global Jakarta: Optmise retention pond system, include considerations for water supply based on retained water, water quality

4. Planning
   - Inform other planning with recommendations such as developing a template on planning and governance based on climate change – DRR (Disaster Risk Reduction) – (terrestrial – aquatic) – ecosystem – community participation principals.

5. Need for consolidation among the community
   - Increasing community awareness as well as their capacity by socialization and capacity building from the very beginning
   - Related to community’s culture: character identification of potential tenants, moving pattern, etc.

6. Institutional
   - Decision of overall approach (blue green metropolis approach, GSW
   - Coordination arrangements
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7 Further action

Through the CTCN support, a number of pathways have been identified to address urban flooding in general and in Jakarta specifically and capacity has been built to pursue these pathways further. The following sequence of actions is anticipated to explore funding opportunities:

1. Consolidate policy considerations into concrete action outlines. Each of the needs and opportunities discussed in Section 6 above shall be presented into action briefs. Such briefs should outline the background/justification for the action, objectives to be pursued, outputs to be generated and required activities. A rough cost estimate should be included and a timeline should be given. A template of an action brief is attached as Annex B.

2. Identify potential funding sources. These include, but are not necessarily limited to local and national government budgets, development partners such as World Bank, Asian Development Bank, European Union and bilateral assistance.

3. Funding dialogues. Explore funding opportunities through bilateral discussions with identified potential funding sources. Such discussions should lead to a consolidation the action briefs.

4. Funding workshop. Overall meeting among identified funding sources to coordinate action development within overall framework.

5. Programme/project development
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References


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APPENDIX A – Policy Workshop Programme
# A Policy Workshop Programme

**Agenda of “Workshop on Policy Recommendation for Flood Reduction and Climate Resilient Infrastructure Development Pathways in Jakarta”**

**Jakarta, 15 May 2017**

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<td>09.15 – 09.30</td>
<td>Opening</td>
<td>Greetings &amp; project overview</td>
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<td>09.30 – 09.55</td>
<td>Presentation 1</td>
<td>Blue Green Jakarta 2030 “Evidence-based visionary overview on turning flood prone Kapuk – Kapuk Muara into a regenerated and resilient waterfront city in North Jakarta”</td>
<td>Prof Dr Ir Jan Sopaheluwakan, M.Sc</td>
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<td>Results of hydrodynamics model and socio-economic studies</td>
<td>Yus Budiyono</td>
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<td>10.20 – 11.25</td>
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<td>Draft of policy recommendation</td>
<td>Dr Ir Tusy A. Adibroto, M.Si</td>
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<td>11.25 – 12.35</td>
<td>Discussion</td>
<td>Divided into two groups: technical issues and socio-economic-regulation issues</td>
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<td>12.35 – 12.45</td>
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<td>12.45 – 13.00</td>
<td>Conclusion &amp; Closing</td>
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<td>Budy Wiryawan and Gorm Jeppesen</td>
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APPENDIX B – Participants in the Policy Workshop
## B Participants in the Policy Workshop

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<td>Tsas ARUM Handayani</td>
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<td>H.M. ALI KUDRO</td>
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Hari, tanggal : Senin, 15 Mei 2017
Pukul : 08.30 WIB s.d selesai
Kegiatan : Workshop on Policy Recommendation for Flood Reduction and Climate Resilient Infrastructure Development Pathways in Jakarta
Tempat : Aula Lt.9 Gd.Dinas Perumahan Rakyat dan Kawasan Permukiman Provinsi DKI Jakarta
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APPENDIX C – Action Brief Template
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## C Action Brief Template

| **Background:** | Provide a very brief description of what has led to the identification of this action |
| **Title:** | The title of the actions |
| **Action Reference:** | Unique identifier for action database and other references. |
| **Justification:** | Provide statements justifying that this action should be considered for funding. |
| **Objective:** | Establish what the action if implemented is expected to achieve. |
| **Expected outputs:** | Identify key outputs required to fulfil the objective. |
| **Activities:** | List key activities that have to take place to produce the outputs. |
| **Assumptions:** | State what assumptions concerning conditions outside the control of the action that must be met. |
| **Risks:** | Identify risks that the source of funding and the responsible for the action should be aware of and try to mitigate. |
| **Means of implementation:** | Logistics, technical, scientific  
Outline expectations for logistic requirements, technical and scientific environment.  
Human Resources  
Outline expectations on human resources engagement |
| **Budget estimate:** | Provide an assessment of budget requirements in very broad terms as detailed assessments can only be made in project appraisal and detailed design. The budget requirements may assess both project preparation (appraisal and design) and project implementation dimensions |
| **Source of funding:** | Identify potential funding sources, including government, development partners, private sector, etc. or combination thereof if applicable. The identification should to the extent possible be aligned with strategies and plans of the funding sources. |
| **Responsible for the action:** | Identify which institutions would be responsible for implementing the action, government and or non-government. One institution should be overall responsible but contributing institutions should as applicable also be identified. |
| **Beneficiary from the action:** | Make qualitative assessment of beneficiary (ies). Quantitative assessment of beneficiary (ies) can at best be made in very broad terms until appraisal. |
| **Schedule:** | Indicate a time schedule for the implementation of the action. |
| **Links to other actions:** | Identify and explain linkages to other actions |
| **Performance indicators:** | Identify verifiable performance indicators that can be used to monitor the implementation of the action. |
| **Comments:** | Provide any comments that are considered useful for the considerations by funding sources and institutions responsible for the action. |
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APPENDIX D – Power-Point Presentation
D  Power-Point Presentations

Presentation I
Example of change in flood risk due to implementation of Eastern Flood Canal (BKT) note that the map of 2007 does not include the BKT

From flood prone area to lakefront city

Green Metropolis Jakarta 2050 Competition (Sepaheluwakan et al., 2013)
Why on Kapuk Polder System?

- Minimum green and blue open space
- Continuously subsided and flooded — Severe ones in 2007 and 2013
- Deviation from the spatial planning
- Densely populated in a mixed use area of “brown” industries, SMEs, warehouses, people housing, and offices
- No added value and gradually deserted area
- Non-integrated 3 polders system: Private polder (PK), and government (Kapuk Muara and Kapuk Pogler polders)

Spatial Planning and the Real Situation

POLDER DI WILAYAH AIRAN BARAT

Strategic Envisioning Blue-Green Resilient Jakarta 2050

Rukayasa kesetiangan fisik — Inginiungan — sosial dalam tataran ruang terapu
Key issues on the pilot area

- Integrated, unified and resilient water management:
  - 2 (gov) + 1 (private) polders
  - Hydrology – drainage – pumping management in polders system
  - Think of near and medium term future retention basins/ponds:
    - Large integrated basin, or
    - Fragment it into smaller smaller basins/ponds
  - Size, depth and extending basin depths w.r.t. return period
- City regeneration and rejuvenation
  - Migrating and deserting industrial area
  - Mixed settlement and “brown” industrial, warehousing and business areas
  - Social and economic transformation to future possible resilient Blue-Green City

Project Summary

- Socio-economy risk assessment
- Policy Brief
  - Risk based spatial plan
  - Urban ecosystem
  - Urban renewal
  - Supply chain
  - Replication
- Climate-neutral infrastructure and pre-urban resilient intervention envisioning

Aim of the Project

1. Detailed flood hazards and risk assessment
2. Designing initial pathways to reduce the climate induced flood risk impact
3. Medium – long term science-based, climate neutral and disaster resilient developmental policy formulation on city regeneration and rejuvenation
4. Better polder management system and potential replication and upscaled elsewhere

Skenario 2030 – 2050

- Banjir
  - Intensitas
  - Kedalaman
  - Piparan
- Berkatangan

- Polder
- Waduk retensi
- Formos
- Fragmentasi Banjir
**Policy implication**

*Impact, City Regeneration and Social Economic Issues*

- Common understanding on people perception, on going mitigation, vulnerability aspects and existing social resilience.
- People preference on relocation of the industries – warehouses and take front city regeneration.
  - “On-site” renewal and healthier housing and settlement.
  - Land access, social system, design aesthetics.
  - Prudent public awareness and education.
  - Participatory approach (people and stakeholders) in formulating the regulation.
- Refinement on the existing regulations (e.g. infiltration wells, polder system, city drainage, etc.).
- Institutionalization of the possible future initiative.

---

**Beyond flood disaster**

- Future risk and damage assessment and Master Planning the Kapuk Polder System.
  - Social economic.
  - Infrastructure.
  - Risk mitigation and adaptation efforts.
- Template of resilience planning in delta city(ies); spatial (re)planning, climate proof action, city regeneration.
  - Climate adaptation measure example.
  - Resilience is an opportunity.
  - Replicable in Jakarta, Pantura and other delta cities.

---

**Food of Thoughts**

- Jakarta is a (global but deteriorating) Delta City needs a total comprehensive Ecosystem – DRR – Climate – Infrastructure & Property – Community Participation strategy.
  - WETTING BACK THE WETLAND & more blue open spaces (polder – retention pond – city regeneration).
  - Land subsidence.
  - Fresh water supply.
  - Groundwater replenishment.
  - Terrestrial and aquatic biodiversity.
  - Socio-cultural benefit.
  - Water based economy, life and leisure.
  - Waterway transportation.
- Explore the possibility of developing flood resilient northern half of (present and future) poldered Jakarta by creating city wide combined polder – retention pond – city regeneration.

---

**Closing remarks**

- This project is about capacity building and science & evidence based decision making and city planning, and.
  - Improving the capability on applying MIKE for higher resolution flood modeling.
- Developing a template on planning and governance based on climate change – DRR – (terrestrial – aquatic) ecosystem – community participation principles.
- Resilience is an opportunity.
FLOOD REDUCTION AND CLIMATE RESILIENT INFRASTRUCTURE DEVELOPMENT PATHWAYS IN JAKARTA

Results of hydrodynamics model and Socio-economic studies

brief summary by Yus Budiyono
yus.budiyono@bappi.go.id

Outline/Project Goals

1. Hydrodynamics model
2. Socio-economic study
3. Capacity building
4. Policy recommendation
5. Future works

Backend data

- LOAR, SRTM, ALOS
- Secondary data
  - river dimensions/cross sections
    - rainfall record
    - land use
  - Surveyed data (validation)
- 513 sub-archments
  - Oasea (excluded)
  - Angke-Pazagahan (blue)
  - Cibinung (excluded)
  - East Jakarta (excluded)

52 Potential solutions with various facts and scenarios

Results of Hydrodynamics model
Maximum inundation
(Feb 2007 case, 50 return period)

2007
2030

Model Results Validation

Results of
Socio-economic study

Methodology

Macro study
Adopt spatial information,
and industry

Secondary data

Focuss Group Discussion

Meso study
Information of flood

Households survey

Micro study
Simulation of socio-economic
on flood risk perception,
assessment, social resilience,
and adaptation
**Result: Macro Study**

- the number of large and medium-sized industries decreases during 15 years because they avoid flood losses, follow zoning regulation or expand their business to cheaper-input-prices areas

**Result: Meso Study**

- Overview of flood damage
- Identification of locations that are still being flooded
- Expectation on future public mitigation e.g., dredging the rivers, optimizing the pumping facilities
- Issue on relocation to vertical houses (rusunawa)

**Result: Micro Study**

**Characteristics of households**

- Low income
- Two or more families in one house
- Most households live in two-floor houses, the second floor is constructed for flood evacuation
- House area less than 36 m²
- 29% respondents still live in semi-permanent buildings
Where to go from here?

- Policy-related works 2017-2018
  - Master plan of blue-green city 2030 (or quicker)
  - Document preparation for revision of related regulation
    (PermenPU 12/2014, Perda Sumur Resapan, Lampiran 66
    polder system on RUTR 2030)
  - Rintisan new policy
    • Building code
    • Model-based Flood Early Warning System
    • Polder management
- 2016-2017 policy recommendation (next presentation)

Where to go from here?

- Policy formulation 2017-2018
  - Detail or revision of related regulation (PermenPU 12/2014,
    Perda Sumur Resapan, Attachment 1 of RUTR 2030 - 66
    polder system of northern Jakarta)
  - New policy framework
    • Polder management
    • Building code
    • Model-based Flood Early Warning System
  - Master plan of blue-green city 2025-2030
- 2016-2017 policy recommendation (next presentation)

This work is supported by

- The good cooperation and supportive works of
  SKPD DKI
- Hydrodynamics model team DHI and BPPT
- Socio economic study team IPB-BPPT
- CTCN-UNEP, KLIHK, DRD DKI
Presentation III

DRAFT REKOMENDASI KEBIJAKAN

Workshop on "Flood Reduction and Climate Resilient Infrastructure Development Pathways in Jakarta"

Dr. Ir. Tjoa A. Abdurrooi M.Si.

Gedung Pusat Perumahan Raya - Jakarta, 15 Mei 2017

REKOMENDASI KEBIJAKAN

- Aspek Hidrologi
- Aspek Sosial-ekonomi
- Aspek Infrastruktur

LATAR BELAKANG REKOMENDASI KEBIJAKAN

Hasil Model Hydrodynamis: Resiko banjir diprediksi akan semakin besar akibat perubahan iklim

Hasil Survei Sosial: Perlu perencanaan Adaptasi

Revitalasi Kiwisari: menggantikan pendekatan hidrologi dengan masalah terdampak "blue green metropolis"

KONSEK IDEAL BLUE GREEN METROPOLIS

Komponen utama:
- Infrastruktur hidrologi: polder beserta retention pond / waduk resapan
- Permukiman rumah susun
- Infrastruktur dasar: mengikuti konsep blue-green metropolis
REKOMENDASI ASPEK HIDROLOGIS

RUTR 2030: Pengembangan 66 sistem polder → fokus pada polder Kapuk (dalam lokasi kajian) yang berada dim 1 cluster (polder PIK, polder Kapuk Muara dan polder Kapuk Poglar)

Opis Manajemen Sistem Polder

- Mengelola 3 polder secara terpisah
- Kajian penyusutan atau pemisahan
- Menyusun polder Kapuk Muara dan Kapuk Poglar dalam satu manajemen
- Kajian Kebijakan Khusus usk swasta
- Menyusun tiga polder dalam satu kesatuan
- Kerja sama public-private partnership

Diperlukan Aturan Tambahan terhadap aturan yang ada sbb:

1. Pembuatan building code sesuai proyeksi kedalaman banjir pada tahun yang ditentukan
2. Peraturan untuk mengecek kondisi tanggul polder secara rutin
3. Regulasi baru mengenai waduk retensi dan sistem pompa
4. Kebijakan flood early warning (FEWS) meliputi:
   a. peningkatan kapasitas penduduk
   b. broadcast hasil model
   c. proses evakuasi

REKOMENDASI ASPEK SOSIAL-EKONOMI & INFRASTRUKTUR

Konsep Hijau Metro (Konsep Hijau Sewan) → Perubahan pola ruang kawasan

Fungsi kawasan dominan residensial dan industri menjadi kawasan dengan fungsi masap dan pengendali banjir

Perubahan pola ruang kawasan: Perubahan pola ruang kawasan yang memungkinkan peningkatan kapasitas

Perlu dilakukan persiapan pemindahan dan penyediaan fasilitas penyekatan dan infrastruktur pengendali banjir

Berdaya pada sosial ekonomi masyarakat:

- Transformasi pola berumah masyarakat: rumah tapak → vertical housing
- Peningkatan ekonomi masyarakat
- Koordinasi antar stakeholder terkait

ASPEK SOSIAL-EKONOMI MASYARAKAT

- Persiapan yang perlu dilakukan: melibatkan key-personalitas masyarakat
- Penyediaan Rumah Susun
- Koordinasi antar stakeholder terkait
- Peningkatan ekonomi masyarakat
- Penanaman nilai-nilai sosial
- Budaya bermasyarakat
- Pola pergerakan dan aktor ekonomi masyarakat
- Penanaman nilai-nilai sosial
- Penanaman nilai-nilai sosial
- Penanaman nilai-nilai sosial
KOORDINASI ANTAR STAKEHOLDER

Sebagai wadah kerjasama dalam tahap pelaksanaan (perencanaan → pendanaan → kolaborasi)

Sebagai wadah yang dapat mengendalikan dan memastikan proses implementasi

Forum atau konsorsium

ASPEK INFRASTRUKTUR

Diperlukan peningkatan kualitas infrastruktur permukiman, yaitu:
- Pengurangan eksploitasi air tanah: menurunkan land-subsideance
- Identifikasi terhadap pola penempatan air bersih eksisting
- Perbaikan sistem drainase perkotaan: jaringan drainase utama dan di dalam kawasan permukiman

TERIMA KASIH