

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



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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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Project number	65800016
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Revision	1
Classification	Open/Restricted/Confidential

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ABBREVIATION

Abbreviation	Full Name
CTCN	Climate Technology Centre and Network
DKI Jakarta	Daerah Khusus Ibukota Jakarta (Provincial Government of Jakarta)
GSW	Giant Sea Wall
IDR	Indonesian Rupees (Indonesian currency unit)
JRC	Jakarta Research Council
NDE	National Designated Agency
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
BAPPENAS	Badan Perencanaan Pembangunan Nasional (National Development and Planning Board)
SKPD	Satuan Unit Kerja Pelaksana Daerah (Local Government Unit Work)
RPJMD	Rencana Pembangunan Jangka Menengah Daerah (Regional Mid-Term Development Plan)

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 (UNFCCC) 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.

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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 metropolis¹ 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).

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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 system².
 - Improve drainage infrastructure (also mentioned under hydrodynamics above).

²Such systems could be distributed decentralized water treatment plants using surface water from clusters of retention ponds.

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5 Policy Workshop

A Workshop on Policy Recommendations for Flood Reduction and Climate Resilient Infrastructure Development Pathways in Jakarta was organised by Jakarta Research Council on 15 May 2017.

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 scenario⁷
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: Optimise 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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- Wijayanti, P., Zhu, X., Hellegers, P., Budiyono, Y., & van Ierland, E. C. (2017). Estimation of river flood damages in Jakarta, Indonesia. *Natural Hazards*, 86(3), 1059–1079.
<https://doi.org/10.1007/s11069-016-2730-1>

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APPENDIX A – Policy Workshop Programme

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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


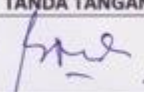
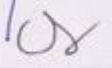


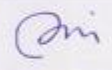

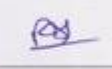
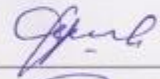
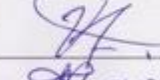

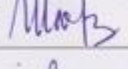
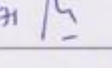
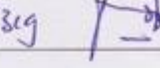
Time	Agenda	Topic	Information
08.30 – 09.00	Registration		
Opening ceremony			
09.15 – 09.30	Opening	Greetings & project overview	Head of Jakarta Research Council represented by Secretary of Jakarta Research Council, Dr Ir Tusy A. Adibroto, M.Si
09.30 – 09.55	Presentation 1	Blue Green Jakarta 2030 “Evidence-based visionary overview on turning flood prone Kapuk – Kapuk Muara into a regenerated and resilient waterfront city in North Jakarta”	Prof Dr Ir Jan Sopaheluwakan, M Sc
09.55 – 10.20	Presentation 2	Results of hydrodynamics model and socio-economic studies	Yus Budiyo
10.20 – 11.25	Presentation 3	Draft of policy recommendation	Dr Ir Tusy A. Adibroto, M Si
11.25 – 12.35	Discussion	Divided into two groups: technical issues and socio-economic-regulation issues	Moderator
12.35 – 12.45	Photo Session		All participants
12.45 – 13.00	Conclusion & Closing		Budy Wiryawan and Gorm Jeppesen

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APPENDIX B – Participants in the Policy Workshop

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B Participants in the Policy Workshop

 DAFTAR HADIR				
		Hari, tanggal	: Senin, 15 Mei 2017	
		Pukul	: 08.30 WIB s.d selesai	
		Kegiatan	: <i>Workshop on Policy Recommendation for Flood Reduction and Climate Resilient Infrastructure Development Pathways in Jakarta</i>	
		Tempat	: Aula Lt.9 Gd.Dinas Perumahan Rakyat dan Kawasan Permukiman Provinsi DKI Jakarta	
NO	NAMA	INSTANSI	NO TELP.	TANDA TANGAN
1	SUBANDONO	BPPT		
2	Renni Rini	DHI	08119183300	
3	Tyas ARUM Handayani	DPP APP	082211192353	
4	Kunti May Wulan	Intern	025695343 904	
5	Meirita	DHI	082119927020	
6	GARY JERRIKEN	DHI		
7	P. Survei Bach	DHI	-	
8	H.M. ALI RIDHO	DPE, Bid Ecologi	08122078727	
9	GRIATU ZAHKA	BPPT	082060820007	
10	MARAYA SHIFA W	DHI	08561089155	
11	MARTINUS	DPE	0013915200	
12	SARASWATI	BPPT	087887000931	
13	H. RIZAN. HM	Kec. Cengkay	081.380117369	

DAFTAR HADIR				
		Hari, tanggal	: Senin, 15 Mei 2017	
		Pukul	: 08.30 WIB s.d selesai	
		Kegiatan	: <i>Workshop on Policy Recommendation for Flood Reduction and Climate Resilient Infrastructure Development Pathways in Jakarta</i>	
		Tempat	: Aula Lt.9 Gd.Dinas Perumahan Rakyat dan Kawasan Permukiman Provinsi DKI Jakarta	
NO	N A M A	INSTANSI	NO TELP.	TANDA TANGAN
14	Saipul Hidayat	Ke-Pepsalan	0811196730	
15	HERU PANATAS	DLH Prov. Dk Jk	082572715	
16	Yus Budiyono	BPPT		
17	Andy Wirgama	DIAE		
18	Jan Supahelwan	DRD	0818-20943	
19	Sury Samie	DRD kam 2	081517023232	
20	Arisa Tobing	DRD		
21	RANDHAN S	BPBD	08131417561	
22	Helwani MM	Ke Penjarang	0821110100	
23	Bambang. H	BPBD	0810720380	
24	Achirwan	BPPT	08129358930	
25	Mukhlir	Kepuk Waru	08131441063	
26	Feba A. Pratomo	BPPT	08121213801	

DAFTAR HADIR				
	Hari, tanggal : Senin, 15 Mei 2017			
	Pukul : 08.30 WIB s.d selesai			
	Kegiatan : <i>Workshop on Policy Recommendation for Flood Reduction and Climate Resilient Infrastructure Development Pathways in Jakarta</i>			
	Tempat : Aula Lt.9 Gd.Dinas Perumahan Rakyat dan Kawasan Permukiman Provinsi DKI Jakarta			
NO	N A M A	INSTANSI	NO TELP.	TANDA TANGAN
27	DEWI ANDHIKA PUTRI	CUKUP REGISTRASI 13021	085715839701	
28	PRASETYO SUNARYO	PARADIGMA RISET INSTITUTE	0816857659	
29	Ilman Bastian S.	DPRKP Bid Perencanaan	3455594.	
30	Novian Andri	BPPT	081802835191	
31	PRINADI P	DRD	0816850104	
32	SISKA YUNITA	SET - DRD		
33	TJandra			
34				
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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

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D Power-Point Presentations

Presentation I

Flood Reduction and Climate Resilient Infrastructure Development Pathways in Jakarta

Dewan • Riset • Daerah • DKI

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

Jan Sopaheluwakan
Chairman, Commission on Development and Environment
Jakarta Research Council

Policy Formulation Workshop
Auditorium, Gedung Dinas Perumahan dan Gedung Pemerintah - DKI
15 Mei 2017

Talk Agenda

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Paparan Utama
Sajombara Green
Waterfront Jakarta

1. **The Inspiration and the Strategic Envisioning:** how it came into being?

2. **What this Project** is all about?

- Key Issues on the Pilot Area
- Project Summary
- Strategic Aim
- Interim Progresses

3. **Concluding Remarks**

- Policy Implications
- Food of Thoughts
- Closing Remarks

Banjir Tempo Doeloe

Merdika Barat

Jatinegara

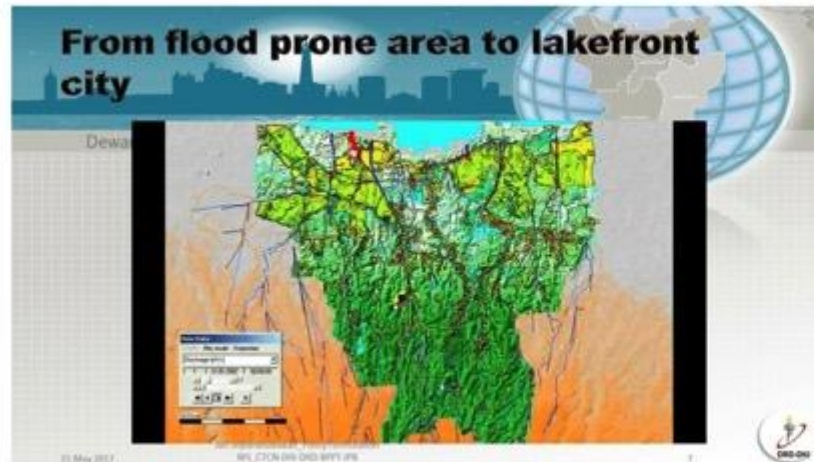
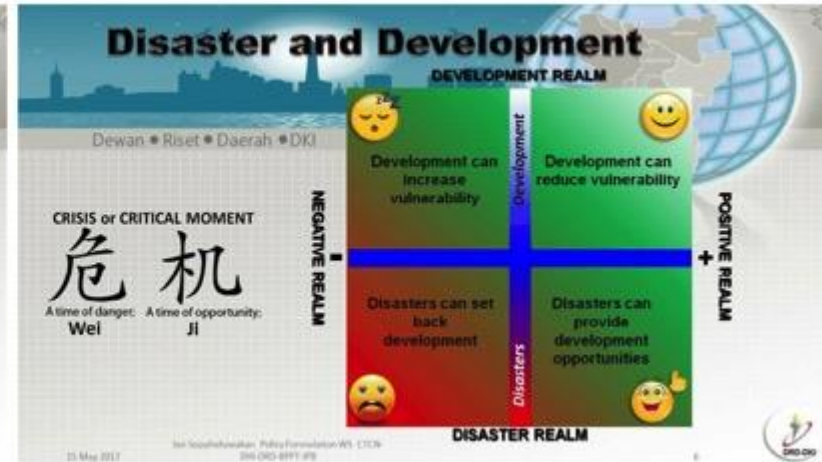
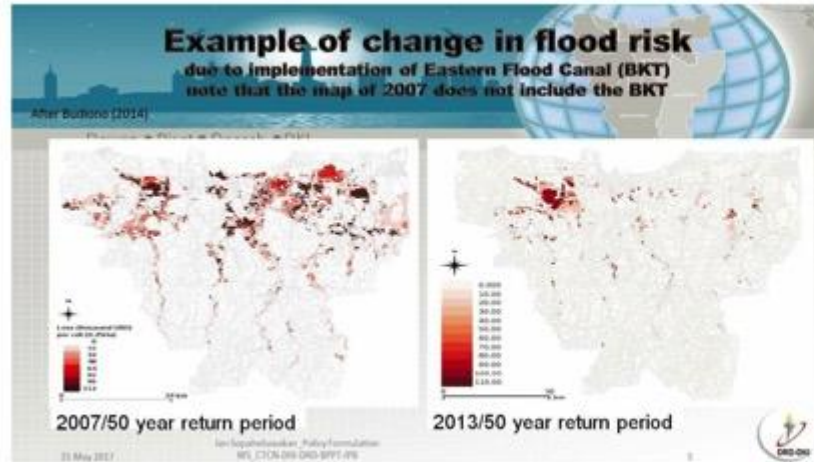
Kalibaru

Ciri Merta

Wetland Jakarta dan Polderisasi


GEOLOGI Wilayah Cakupan: Kawasan Jakarta

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Why on Kapuk Polder System?

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

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Spatial Planning and the Real Situation

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POLDER DI WILAYAH ALIRAN BARAT

Revisi: Sistem Tata Air 2010



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Strategic Envisioning Blue-Green Resilient Jakarta 2050

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Blue-Green Jakarta 2050 (© Supaheluwakan et al., 2013)

Rekayasa keselarasan fisik – lingkungan – sosial dalam tatanan ruang terpadu

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Key issues on the pilot area

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- **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 several smaller basins/ponds
 - Size, depth and cascading 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

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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

DSS
Proto-Decision Support System

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Aim of the Project

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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 upscaling elsewhere

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Skenario 2030 – 2050

Perencanaan banjir

- Konsolidasi alamiah
- Ekstraksi air tanah
- Beban bangunan
- Telekomik

Perencanaan banjir

- Curah hujan
- Kenaikan paras muka laut

Tata ruang

- Industri
- Pemukiman
- Perkantoran
- Pergudangan

Banjir

- Intensitas
- Kedalaman
- Paparan

Berketahanan Banjir

Mitigasi, Adaptasi, Peluang Baru

- Polderisasi
- Waduk retensi
- Pompa
- Regenerasi Kota
- Kota Hadap Air

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Policy implication (Impact, City Regeneration and Social Economic Issues)

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- Common understanding on people perception, on going mitigation, vulnerability aspects and existing social resilience
- People preference on relocation of the industries – warehouses and lake front city regeneration
 - “On-site” newer 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

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Beyond flood disaster

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- 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

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Food of Thoughts

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- 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) polderized Jakarta by creating city wide combined polder – retention pond – city regeneration

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Closing remarks

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- 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

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Presentation II

**FLOOD REDUCTION AND CLIMATE RESILIENT
INFRASTRUCTURE DEVELOPMENT
PATHWAYS IN JAKARTA**

Results of
hydrodynamics model and Socio-economic studies

brief summary by Yus Budiyo
yus.budiyo@bppt.go.id

Outline/Project Goals

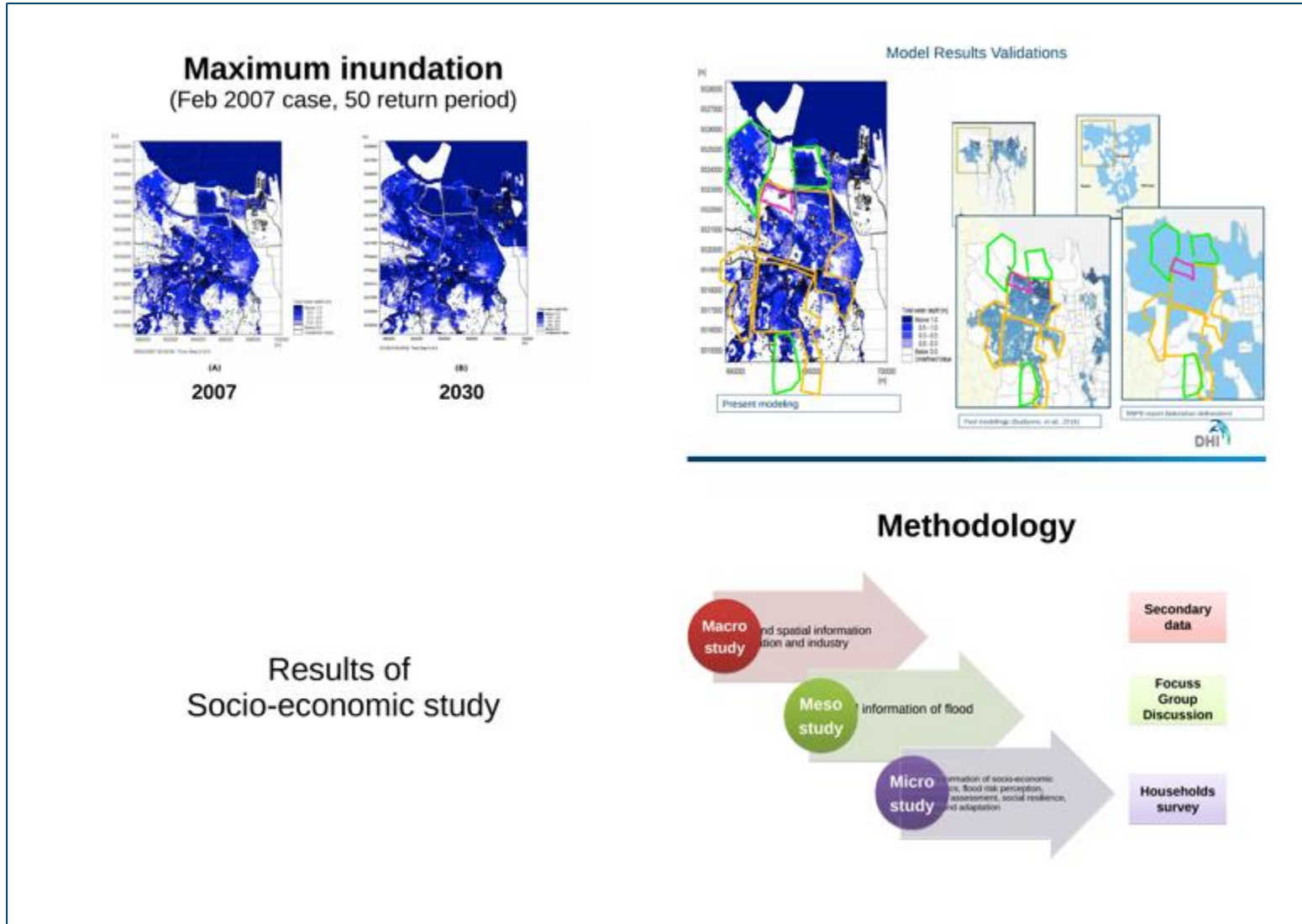
1. Hydrodynamics model
2. Socio-economic study
3. Capacity building
4. Policy recommendation
5. Future works

Results of
Hydrodynamics model

Backend data



- LIDAR, SRTM, ALOS
- Secondary data
 - river dimensions/cross sections
 - rainfall record
 - land use
- Surveyed data (validation)
- 513 sub-attachments
 - Ciadane (excluded)
 - Angke-Pesanggrahan (Blue)
 - Ciliwung (Magenta)
 - East Jakarta (excluded)
- 63 Rainfall Stations with various facts and scenarios



Methods

FGD Cengkareng, 23 Jan 2017 FGD Penjaringan, 24 Jan 2017 FGD Industry, 27 Feb 2017

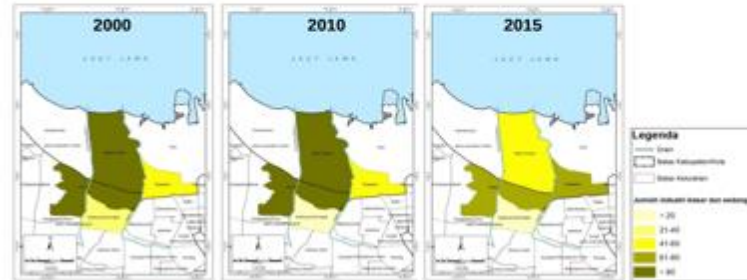
Pilot study **Respondents houses**

Household survey:

- 1-12 Feb 2017
- Sub-district: Kapuk, Kedaung Kali Angke, Kapuk Muara, Pejagalan
- 16 RWs, 135 RTs, and 342 households

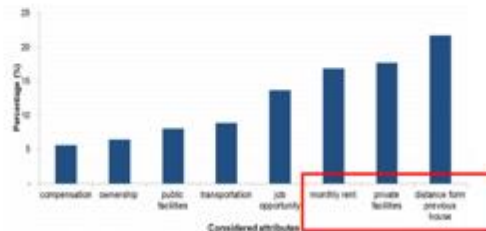
Result: Macro Study

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



Result: Meso Study

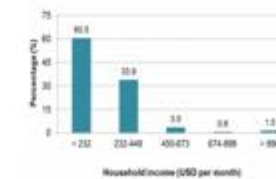
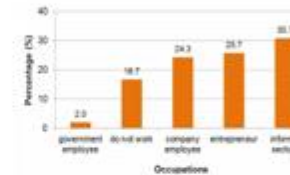
- Overview of flood damage
- identification of locations that are still being flooded
- expectation on **future public mitigation** e.g., dredging the rivers, optimizing the pumping facilities
- Issue on relocation to vertical houses (rusunawa)



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, KLHK, DRD DKI

Presentation III

DRAFT REKOMENDASI KEBIJAKAN

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

Dr. Ir. Tussy A. Adibroto, M.Si

Gedung Duta Perumahan It.9 - Jakarta, 15 Mei 2017

REKOMENDASI KEBIJAKAN

- Aspek Hidrologi
- Aspek Sosial-ekonomi
- Aspek Infrastruktur

LATAR BELAKANG REKOMENDASI KEBIJAKAN

Hasil Modeling Hidrodinamika:
Resiko banjir diprediksi akan semakin besar akibat perubahan iklim

➔

Hasil Survei Sosek:
Perlu Rencana Adaptasi
→ direncanakan bersama masyarakat terdampak

➔

Revitalisasi Kawasan menggunakan pendekatan hidrologis dan ruang terbuka "blue green metropolis"

KONSEP IDEAL BLUE GREEN METROPOLIS

Komponen utama:

- Infrastruktur hidrologi: polder beserta *retention pond* / waduk resapan
- Permukiman: rumah susun
- Infrastruktur dasar: mengikuti konsep *blue-green metropolis*



- 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





ASPEK INFRASTRUKTUR

Diperlukan peningkatan kualitas infrastruktur permukiman, yaitu:

- Pengurangan eksploitasi air tanah: menurunkan *land-subsidence*
- Identifikasi terhadap pola pemenuhan air bersih eksisting
- Perbaikan sistem drainase perkotaan: jaringan drainase utama dan di dalam kawasan permukiman

