Dealing with Greater Jakarta Floods in Times of Climate Change

POLICY BRIEFS

English Version

OCTOBER 2022
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ENGLISH VERSION

Dealing with Greater Jakarta Floods in Times of Climate Change

Trikurnianti (Yanti) Kusumanto
Annisa Triyanti
Wiwi Tjiook
(Editors)

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IDN LIVEABLE CITIES
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Editors: Trikurnianti (Yanti) Kusumanto, Annisa Triyanti, and Wiwi Tjiook
Layout by Y. Yulia, Ruben Tutuko, Dicki Elhasani and Lisana Shidqina
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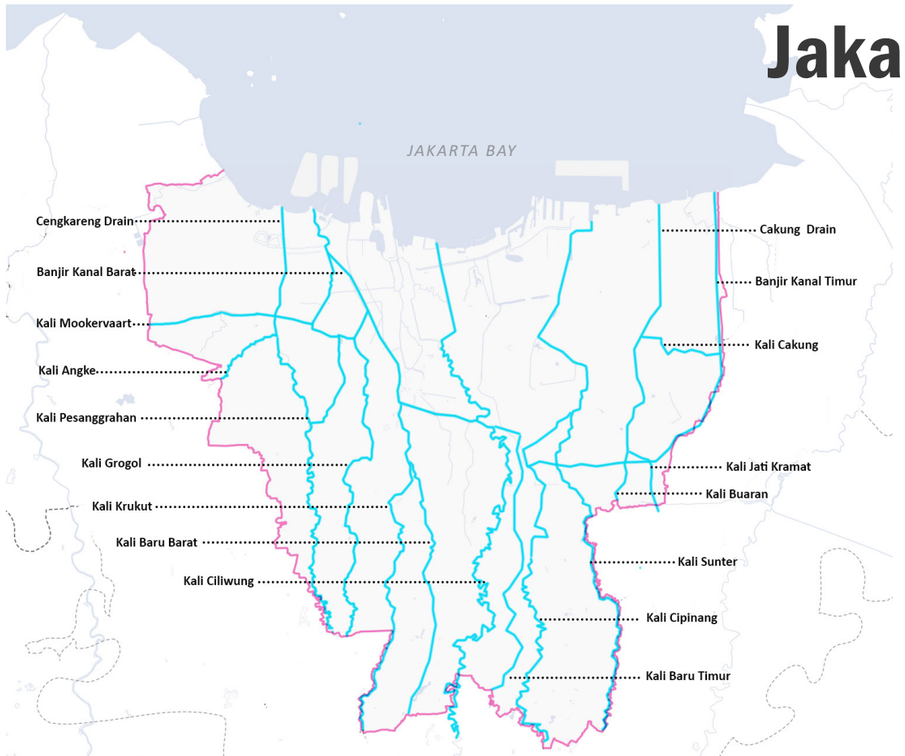
Greater Jakarta Map



Jakarta Map

Foreword

The metropolitan area of Greater Jakarta, Indonesia, has a long history of flooding, which persists in today's megacity. Triggered by the severe flooding in early 2020, members of the Indonesian diaspora community in The Netherlands held the Focus Group Discussion (FGD) 'Dealing with Greater Jakarta Floods in Times of Climate Change' on 27 February 2020 at the Indonesian Embassy in The Hague,- The Netherlands. One of the outcomes of this FGD is a general policy brief with recommendations to address the flooding problem. This Policy Brief Series continues the content of the initial policy brief but aims to provide more in-depth insights into the recommendations. The Policy Brief Series is the work of a multidisciplinary group of Indonesian and Dutch researchers and professionals to provide policy-relevant, timely, and knowledge-based insights and knowledge related to Jakarta's flooding in the context of climate change.

The aims of the Policy Briefs are threefold:

1. To provide meaningful insights to policymakers and decision-makers in relevant public and private sectors, as well as civil society;
2. To encourage the development of an Indonesian-Netherlands bilateral cooperation platform; and
3. To trigger a public debate on this important topic in Indonesia, The Netherlands and beyond.

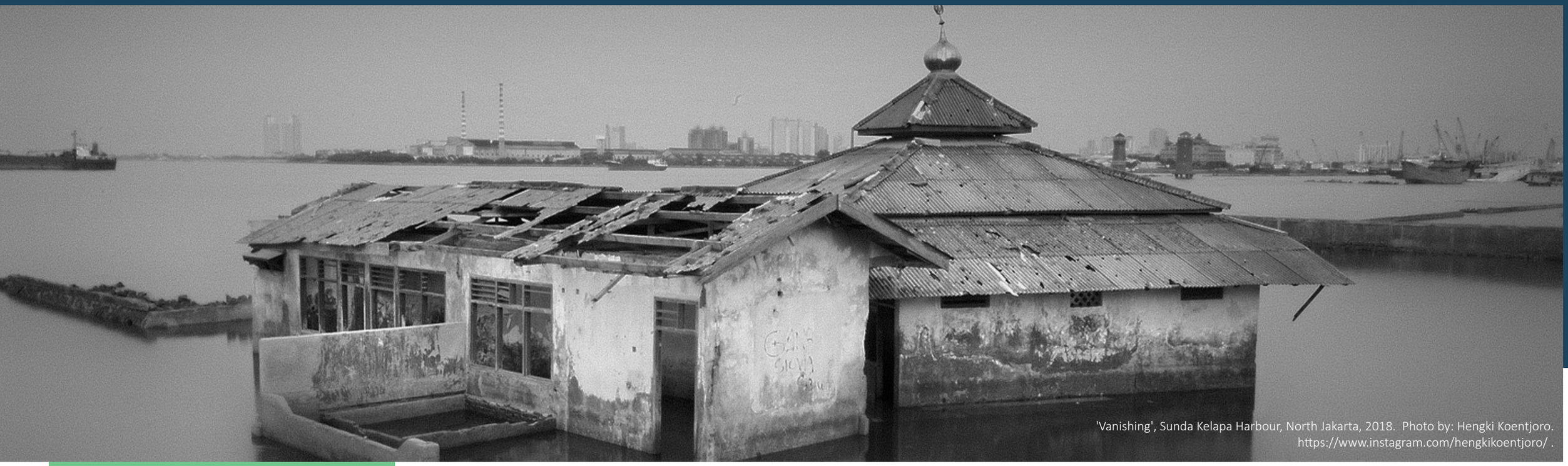
The Initiators/Editors:

Trikurnianti (Yanti) Kusumanto –
TYK research and action consulting, The Netherlands;

Annisa Triyanti – Utrecht University, The Netherlands;

Wiwi Tjiook – Indonesian Diaspora Network in The Netherlands, Taskforce Liveable Cities (IDN Liveable Cities).

Introduction



'Vanishing', Sunda Kelapa Harbour, North Jakarta, 2018. Photo by: Hengki Koentjoro. https://www.instagram.com/hengkikoentjoro/ .

Why these Policy Briefs

The six Policy Briefs presented here are a response to the increasing impacts of flooding on Greater Jakarta[i]. The more recent flooding of the metropolitan area has revealed the region's vulnerability to extreme floods. The core message in these Policy Briefs is unanimous: the flooding is a wake-up call to address the consequences of extreme weather and sea-level rise due to climate change, for some areas further jeopardised by land subsidence.

The topics covered in the Policy Briefs are diverse, yet all relate in some way to climate change as a relatively new flooding context for Greater Jakarta. Although floods are not new to the region, climate change requires novel approaches to understand and deal with floods and their potential impacts on people, the environment and society.

[i] These Policy Briefs use the terms Greater Jakarta, Jakarta Metropolitan Area, and JABODETABEK-PUNJUR interchangeably. See Glossary for their definition.

What are They About

The Policy Briefs essentially encapsulate relevant, timely and science-based insights and knowledge for use by public policymakers and decision-makers in the public, private and civil society sectors. They can use these to ground their policies and decisions when addressing the flooding problem. The briefs also intend to trigger a public debate in Indonesia and beyond on this issue.

Policy Brief 1 - Flood Risk in Jakarta: Current and Future Challenges

Written by:

- **Yus Budiyono** (Agency for the Assessment and Application of Technology (BPPT)/IIndonesian National Research and Innovation Agency (BRIN), Jakarta));
- **Pini Wijayanti** (Bogor Agricultural University (IPB), Bogor);
- **Miga M. Julian** (Bandung Institute of Technology (ITB), Bandung); and
- **Siswanto** (Meteorological, Climatological and Geophysical Agency (BMKG), Jakarta)

This first Policy Brief discusses what the climatic and socio-economic drivers and governance challenges of the current and future flood risks are. It focuses on the question how future flood risks look like under different scenarios. In essence, the policy brief presents a tool that measures recurring disaster in monetary units. Hence, the tool is useful for decision-making in sequencing both mitigation and adaptation options according to the damage saved.

Policy Brief 2 - Alternative Measures for Flood Risk Management in Jakarta

Written by:

- **Hadi Susilo Arifin** (Bogor Agricultural University (IPB), Bogor);
- **R.L. Kaswanto** (Bogor Agricultural University (IPB), Bogor);
- **Bramka Arga Jafino** (Delft University of Technology); and
- **Thanti Octavianti** (University of the West of England, Bristol, United Kingdom).

Three approaches to flood risk management for Greater Jakarta are discussed in this Policy Brief: the predominant infrastructure (hard) engineering approach, the ecological (green) engineering approach and the socio-institutional (soft) engineering approach. To effectively handle flooding, an infrastructure approach accompanied by both ecological and socio-institutional approaches is recommended.

Policy Brief 3 - Working Towards an Adaptive Spatial Planning Policy for Flood Risk Management in Greater Jakarta

Written by:

- **Dian Afriyanie** (Research Centre for Ecology and Geospatial, Lokahita Foundation, Bandung);
- **Tristam Pascal Moeliono** (Parahyangan Catholic
- University, Bandung);
- **Annisa Triyanti** (Copernicus Institute of Sustainable Development, Utrecht University); and
- **Thanti Octavianti** (International Water Security Network, University of the West of England, Bristol, United Kingdom).

An awareness of the flood risk challenges and the availability of appropriate flood risk management measures may not be helpful unless strategies are in place to reduce flood risk. A spatial planning policy is one such potential strategy. This Policy Brief scrutinises the flood adaptation and mitigation efforts in the Greater Jakarta Urban Spatial Plan as mandated by Presidential Regulation No. 60 of 2020. The Brief provides recommendations for implementing the policy to realise adaptive spatial planning.

Policy Brief 4 - Dealing with Greater Jakarta Flooding Inclusively from Social, Environmental and Economic Perspectives

Written by:
- **Trikurnianti (Yanti) Kusumanto** (TYK research & action consulting, The Netherlands);
- **Gusti Ayu Ketut Surtiari** (Indonesian National Research and Innovation Agency (BRIN), Jakarta);
- **Sita van Bemmelen** (Independent, Denpasar);
- **Pini Wijayanti** (Bogor Agricultural University (IPB), Bogor);
- **Tristam Pascal Moeliono** (Parahyangan Catholic University, Bandung); and
- **Dicki Elhasani** (Wageningen University & Research).

Strategies for reducing flood risk, such as a spatial planning policy, may only work if they are socially, environmentally and economically inclusive. This Policy Brief asserts that this can be attained by building synergies between the three global policy fields of the Sustainable Development Goals, Disaster Risk Reduction and Climate Change Adaptation. The Brief discusses opportunities in existing development policies and spatial plans of the Special Capital Region of Jakarta (DKI Jakarta) and of Greater Jakarta for such synergy building and recommends a way forward.

Policy Brief 5 - Multi-Stakeholder Platform for Integrating Flood Risk Management with Spatial Planning in Greater Jakarta

Written by:
- **D. Ary A. Samsura** (Radboud University);
- **Trikurnianti (Yanti) Kusumanto** (TYK research & action consulting, The Netherlands); and
- **Annisa Triyanti** (Copernicus Institute of Sustainable Development, Utrecht University).

The integration of flood risk management with spatial planning is another strategy to reduce flood risk. Stakeholder collaboration is thereby a must. Policy Brief 5 gives recommendations for the effective functioning of the coordinating agency mandated by Presidential Regulation No. 60 of 2020 concerning the Greater Jakarta Urban Spatial Plan. The Brief envisions this agency as a multi-stakeholder collaboration platform for applying this flood risk reduction strategy.

Policy Brief 6 - Towards a Climate-Resilient Jakarta: Recommendations for Comprehensive Capacity Building

Written by:
- **Nikéh Booister** (SWECO Netherlands B.V.);
- **Y. Yulia** (IDN Liveable Cities);
- **T.H. (Rick) Heikoop** (Rotterdam University of Applied Sciences);
- **F.X. Suryadi** (IHE Delft Institute for Water Education); and
- **Y.H. (Wiwi) Tjiook** (IDN Liveable Cities).

Addressing the flooding of Greater Jakarta may be difficult if human and institutional capacities fall behind. This Policy Brief provides recommendations for planning, designing and implementing comprehensive capacity building with a focus on floods in the context of climate change. Drawing on best practices from capacity-building activities in Greater Jakarta and other areas in Indonesia, the Brief discusses meaningful insights for formulating an ideal capacity-building model.

Break out session during Focus Group Discussion, February 27, 2020. Photo by: Indonesian Embassy, The Hague.

Who Initiated the Policy Briefs and Who Were Engaged

The Policy Briefs are an initiative by members of the Indonesian diaspora community in the Netherlands concerned about the Greater Jakarta flooding. The initiative has engaged Indonesian and Dutch researchers and professionals affiliated with research institutes, universities, consulting firms and government agencies in Indonesia, The Netherlands, and the United Kingdom. The involvement of Dutch and Indonesian agencies and organisations is aimed to encourage Dutch-Indonesian bilateral partnership in the collective quest for addressing the Greater Jakarta flooding in the context of climate change.

Limitations

While some Policy Briefs draw on previous and existing research of the authors involved, others are not based on empirical work and result from a review of relevant literature and policy documents. Furthermore, no spatial analysis with geospatial data was performed on the Greater Jakarta region. The Policy Briefs may therefore have limitations. Nonetheless, the Authors believe that their scientific, professional and observational knowledge form a solid basis for the content of the Policy Briefs.

Disclaimer

The content presented in these Policy Briefs belongs solely to the authors involved and not to the authors' employer, organisation, or funder.

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The Policy Briefs were reviewed by (in alphabetical order):
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- **Annelies Zoomers** (Utrecht University).

For the excellent layout and design of the Policy Briefs, words of thanks are forwarded to: **Y. Yulia, Ruben Tutuko, Dicki Elhasani, and Lisana Shidqina**.

POLICY BRIEF 1

Flood Risk in Jakarta: Current and Future Challenges

Yus Budiyono
Pini Wijayanti
Miga M. Julian
Siswanto

Executive Summary

Flood risk is presented in monetary units showing the expected annual damage. Risk is calculated as a function of flood hazard, exposure, and vulnerability. The most recent estimation of city-wide flood risk showed that Jakarta could incur flood risk of USD 186 million per year. By 2030, the projected flood risk could increase to USD 521 million. The increasing flood risk stems from a complex interaction of natural and anthropogenic factors, mostly related to the rapid change of socio-economic systems in the city. Climate change also plays a role in changes in flood risk in the future, even though the standard deviation is large. The study revealed that the most challenging element to increase flood risk is land subsidence (USD 421 million), followed by land use change (USD 270 million), and sea level rise (USD 212 million). While a projection based on the impact of climate change is very large, attention needs to be paid to the more frequent extreme events over Greater Jakarta. Among various options, we ultimately recommend a polder-based management system to manage floods into smaller fractions. By using the Polder System Plan 2030 that is incorporated in Special Capital Region (DKI) of Jakarta Regulation Number 1 of 2012 concerning Regional Spatial Plan 2030, we observe that a successful maintenance of 12 out of 66 polders could save 81% of flood risk in the near future.

Residents of Muara Angke in North Jakarta are severely confronted with land subsidence. Photo by: Martin Pattimahu, 2013.

Introduction

Given the severity of flooding in Jakarta, there is a clear need for risk-based information to enable current and future climatic and socio-economic adaptations.

Flooding and street congestion are persistent problems for Jakarta. Both issues have featured in electoral campaigns since the first democratic governor election in 2007. Street congestion has been reduced by the MRT (Metro Rail Transit) train system and busway network, recognised by Jakarta winning the Sustainable Transport Award (STA) in 2021 [1]. Floods, however, have become more severe due to climate change, rapid land subsidence rates, and from the expansion of urban areas onto the upland areas. Jakarta is one of the top 20 major world cities with the highest flood risk by 2050 [2].

Flood risk is presented in monetary units in order to predict the expected annual cost of damage. It is calculated as a function of flood hazard, exposure (land use), and vulnerability (stage-damage function). The most recent estimation of city-wide flood risk showed that Jakarta could incur flood risk of 186 million USD per year [3]. By 2030, the expected flood risk could increase to 521 million USD per year. The increasing flood risk stems from a complex interaction of natural and anthropogenic factors, mostly related to the rapid change of socio-economic systems in the city.

Given the severity of flooding in Jakarta, there is a clear need for risk-based information to enable current and future climatic and socio-economic adaptations [4]. Flood risk assessments are becoming an essential tool for rational decision-making [5]. However, as qualitative flood risk assessments have limits in representing real flood risk scenarios, they are insufficient for identifying appropriate flood risk management measures. This Policy Brief provides an overview of quantitative flood risk assessment and how such information can be beneficial in risk reduction planning for stakeholders in Jakarta, particularly the Jakarta Government, the National Development Planning Agency (Bappenas), and the National Agency for Disaster Management (BNPB).

Key Messages and Recommendations

- Given the severity of flooding in Jakarta, there is a clear need for risk-based information to enable current and future climatic and socio-economic adaptations.
- This Policy Brief provides an overview of quantitative flood risk assessment and how such information can be beneficial in risk reduction planning for stakeholders in Jakarta.
- The Objectives of the Policy Brief is to answer the following questions:
  i. What are the climatic and socio-economic drivers and governance challenges of the current and future flood risks?
  ii. What do future flood risks look like under different climatic and socio-economic scenarios?
  iii. What decision support tools are available to help understand, mitigate, and adapt to future flood risks?
- We provide recommendations that are based on: causes of flood risk increases; what Jakarta has successfully done; and what Jakarta could achieve in the near future.
- We also make note of recommendations and areas that are not yet covered.
- Among the various options, we recommend a polder-based management system to manage floods into smaller fractions. By using the Polder System Plan 2030 that is incorporated in Regional Regulation of DKI Jakarta Number 1 of 2012, we observe that a successful maintenance of 12 out of 66 polders could save 81% of flood risk in the near future.

The Importance of Estimating and Understanding Flood Risk

The importance of flood risk estimation relies on the benefit of disaster risk investigation as a decision support system to the government. At the country level, flood risk has been presented by Bappenas and BNPB in the National Action Plan for Disaster Risk Reduction (NAP-DRR) during the years 2010–2012. It served the following purposes:

1. **Budget justification**
   Flood risk measures are, by and large, financed by public expenditure. From a public policy perspective, estimating flood risk is important for reassuring residents that investments made in mitigation and adaptation policies are economically sound and socially beneficial.
2. **Prioritising alternatives**
   Flood risk measures vary in format and budget. Understanding flood risk would enable decision-makers to prioritise alternative measures that can reduce risk.
3. **Mobilising resources**
   Estimating flood risk would help decision-makers decide the number of mitigations or adaptation measures that is sufficient and the appropriate timeframe for implementation.
4. **An uncertain future**
   A simple extrapolation of past experiences in flood management for future risk is inadequate due to the dynamic nature of flooding caused by uncertainties regarding climate and socio-economic change.

Objectives

This Policy Brief responds to the above focus areas by aiming to answer the following three questions:

1. What are the climatic and socio-economic drivers and governance challenges of the current and future flood risks?
2. What do future flood risks look like under different climatic and socio-economic scenarios?
3. What decision support tools are available to help understand, mitigate, and adapt to future flood risks?

What is 'Risk'?

Risk is a product of the following three interlinked elements [6,7]:

1. **Hazard:** The frequency and intensity of natural disasters or long-term trends that may physically impact the welfare of a society, in the present Policy Brief Series alternatively defined as the physical flood event, including its characteristics and probability of occurrence.
2. **Exposure:** The presence of people and assets that could be negatively affected by a hazard.
3. **Vulnerability:** The propensity to be negatively affected, including sensitivity to and the capacity to adapt and respond to a hazard. In practice, these are the depth-damage functions for each land use class.

The analysis of the causes behind increasing flood risk must take these elements into account. The first element is a product of the flood hazard model using design rainfall expected to occur once per 100 years (the return period). The second element includes the economic value comprehending assets contained in land use maps. This in turn indicates flood risk in monetary terms, which is a valuable decision-making tool.

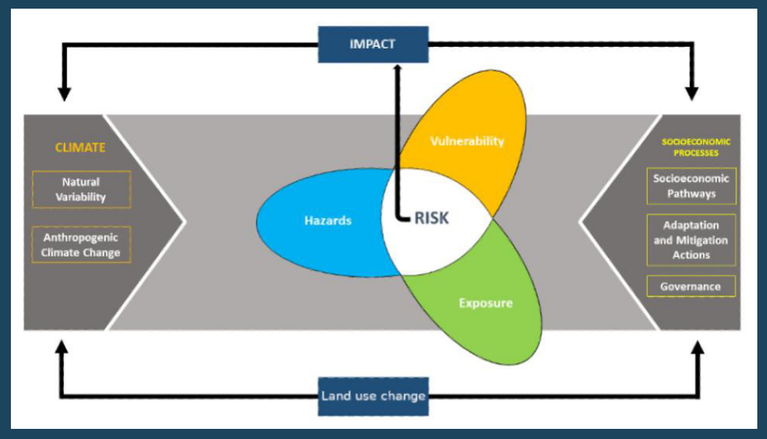

Fig. 1.1
Framework of analysis for flood risk assessment showing the interplay of the risk elements Hazards, Exposure, and Vulnerability, along with the interactions among the physical climate system and socio-economic processes (adapted from [7]).

Recent Updates to Climatic and Socio-Economic Drivers of Flood Risks in Greater Jakarta

CLIMATIC DRIVERS AND PHYSICAL DRIVERS

Flood risk
Predictions show that flood risk will increase between 211% and 362% by 2030 [3] and between 322% and 402% by 2050 [8]. A combination of climate change, sea-level rise, and urban development are responsible for this expected increase.

Land use changes and land subsidence
Changes in land use and land subsidence may contribute to an increase in the flood inundation volume. A flood risk model based on modelled land use over Greater Jakarta has shown an interplay of land use change and land subsidence between 2013 and 2050 will result in an estimated 36.8% increase [9]. Another flood risk model using direct extrapolation of available land use reports showed a 45% increase between 2013 and 2030, while land subsidence contributed to a 226% increase [3]. Differences in the two estimation are due to the underlying model of land dynamics controlling the flood risk model.

Extreme rainfall events
Extreme rainfall may lead to flooding events, especially during the wet season [10]. Between 1866–2010, there has been an increasing trend for extreme daily rainfall events in Jakarta. The trend has been more marked in the last half-century.

Future climate scenarios
The area and depth of flood inundations are predicted to increase. An interplay of land subsidence and sea level rise between 2000 and 2050, will increase the flood hazard area in the northern half of Jakarta to 110.5 km² [11]. The impact of climate change alone for the Ciliwung river basin up to Manggarai will increase flood inundation areas and depths from 6% to 31% for upper (Representation Concentration Pathways 4.5 and 8.5) climate projections scenarios [12].

SOCIO-ECONOMIC DRIVERS OF EXPOSURE

Economic growth
In 2019, prior to the Covid-19 pandemic, economic growth in Jakarta was about 5.89% [13]. This indicates a growth in business and community assets, as well as economic activities.

Population density and growth
The metropolitan area of Greater Jakarta has a high population density of approximately 15,900 people per km2 [13], twice that of Singapore. This density combined with a population growth of around 1.19% per year, will result in more people living in flood-prone areas. Furthermore, rapid urbanisation is undermining the construction of affordable housing for low income and politically weak communities causing an increase in slum residents.

Population growth and economic growth
The growing demand in groundwater extraction in built-up areas due to population growth and economic growth results in a higher rate of land subsidence. Although the land subsidence rate varies spatially and temporarily within Jakarta, it varies from 0.15 to 0.21 m/year [14,15], much faster than the current and projected sea level rise of 0.04-0.1 m/year [16,17].

SOCIO-ECONOMIC DRIVERS OF VULNERABILITY

Poverty increases flood vulnerability and can worsen poverty
The Jakarta poverty index was 0.40% (poverty depth) and 0.07% (poverty severity) in 2019 [13]. Poverty increases flood vulnerability because it limits residents' ability to cope with flood damage and arrange private flood measures. Also, flooding can worsen poverty. The effects of floods vary across Jakarta's population whereby low-income communities are disproportionately more affected by flood events. This inequality will grow worse as the frequency and magnitude of floods increase. This inequality remains high during the Covid-19 pandemic.

The third element is a synthesis bringing forth depth-damage curves. While a hazard can be represented by both a factual flood and a design flood, the resulting flood risk can indicate either direct damage or potential welfare losses in response to flood disturbances that can affect a society. A factual flood predicts the damage caused by an actual occurrence, whereas a design flood is beneficial for annual or inter-annual planning.

In Fig.1.1, the three interlinked risk factors are shown: Hazard, Exposure and Vulnerability. These are broadly categorised as climatic and socio-economic drivers.

In this Policy Brief, we revisit how these drivers have changed over time and how they could change in the future. We provide recommendations on the implications for flood risk management in Greater Jakarta.

Recommendations

Based on investigations that are available, we assess implemented, planned, and available flood mitigation and adaptation strategies in Jakarta. In the following sections, we detail these implemented and planned strategies and provide recommendations. We also consider the temporal scale, necessity and their effectiveness as determined by past studies.

Recommendation based on causes of flood risk increases

Land subsidence

Land subsidence is the most significant cause of increased flood risk in Jakarta. An extrapolation of the 1990-2010 data up to 2030 predicts a flood risk increase of 226% based on the 2013 risk [3]. The subsidence scenarios used in this study are a direct extrapolation of past trends, allowing for spatio-temporal dynamics of the increase. Earlier research proposed implementing measures for reducing soil water extraction, as this is the main cause of land subsidence in Jakarta [18]. A simple calculation comparing remaining water production to sufficiently supply Jakarta is of the same order of magnitude as the projected increase in risk per annum resulting from land subsidence, land use change, and climate change up to 2030 [3].

Land use change

An extrapolation of simulated flood risk using the available DKI Jakarta land use maps from 1980, 1995, 2002, and 2009 predicts a flood risk increase in 2030 of 45% [3]. Interestingly, for an ideal land-use scenario in 2030 with a fully implemented DKI Jakarta Regional Spatial Plan 2030, flood risk could be reduced by 12% compared to the current risk [3].

Sea level rise

Contrary to the general perception held by people in coastal areas that the sea level is rising based on the increased frequency of floods from the sea, sea-level rise only contributes to a minor 14% increase in flood risk [3]. While the inhabitants of coastal areas experience almost diurnal rob (tidal flooding), models show that the rate has only increased by millimetres whilst subsidence has increased by centimetres or tens of centimetres in the worst affected places. Even if both phenomena increase at the same rate annually, the flood risk model shows that the cost of sea-level rise per cm is less than half the cost of land subsidence. The precise calculation is USD 2.6 million versus USD 5.5 million per cm annually [3].

Climate change

As shown above, estimations of climate change impact on flood risk in Jakarta widely range [12]. This is due to the many climate models and radiative forcing scenarios available. The risk estimates range from USD 24-380 million p.a. in 2030 to USD 34-517 million p.a. in 2050 [3]. This illustrates that climate change needs to be accurately integrated in flood management for until at least 2030. A decisive impact of climate change is the increased maximum rainfall amount (Rx1day and Rx2day) and the risk of floods caused by the 1% highest rainfall intensity being 2-3 times higher today compared with past climate [10]. With recent floods such as the one on 1st January 2020, the new record rainfall daily maximum intensity was the highest since the rainfall record of 1866 [19]. Due to such extremes, drainage systems in Jakarta need to be intensively reorganised and at the very least take account of such events.

Recommendation looking at what Jakarta has successfully done

Eastern Flood Canal (BKT)

Between the two subsequent big floods of 2007 and 2013, the plan was that the Eastern Flood Canal (BKT) should aim to divert inundations in the eastern part of Jakarta directly into the sea. When comparing two hydrodynamic models between the two events, schematisation of hydrodynamics models has shown a decrease of flood inundation by 27% in width or by 34% in volume. Risk calculation on the successfulness of BKT based on flood occurrence of a 50-year flood return period shows a decrease of 35% or USD 311 million [3].

Flood early warning system

Jakarta has formally adopted a flood early warning system (FEWS) as seen in the so-called 'Siaga 1-2-3-4' status [20]. The system sees records of water level of upland areas as a basis of prediction of flood arrival more downstream. A hydrodynamic model with more detailed flood arrival is then viewed as a sophistication of the system. Incorporating model results into FEWS has decreased flood risk for all land-use classes by 1.9% against total risk. For residential land use classes, a 13% reduction has been achieved. The effectiveness can be increased to 12% reduction for Jakarta or 84% for residential areas, given that all houses respond to the warning and that they recognise flood adaptation strategies [21].

Consequently, we recommend an integration of the hydrodynamic model due to its significance within the current flood early warning system. In particular, for the reason that the current FEWS is effective if applied to inhabitants along riverbanks.

Recommendation based on what Jakarta could achieve in the near future

Polder management

Jakarta will divide its area into 66 polder systems [22]. Flood risk studies have shown that good maintenance of just three polders (namely Kapuk Muara (Kapuk I, II, III), Kapuk Poglar, and Penjaringan Junction), can have a huge impact on reducing the overall risk. The reduced risk by managing the three polders is USD 92 million per year under the current situation, or USD 153 million per year under the future scenario (50% of the current risk). Interestingly, the total investment in the three polders is USD 10.25 million or 3.2% of the total cost for all 66 polders [23].

Extending the management to 12 polders by adding Sunter Timur III (Rawa Badak), Sunter Utara, Ancol Pademangan, Muara Angke, Komplek Dewa Kembar, Muara Karang, Sunter II Kebantenan, Pantai Indah Kapuk (19) and Sunter Timur IB could reduce the current risk by USD 104 million per year (i.e., 56% of current risk), or by USD 400 million per year under the future scenario (i.e., 81% of future risk) [23].

Implementation of spatial plan 2030

An implementation of Damage Scanner-Jakarta using the official DKI Jakarta Regional Spatial Plan 2030 [24] demonstrated that a complete implementation of the spatial plan would decrease flood risk by 12% [3]. In essence, the spatial plan shifts areas with higher flood damage away from flood prone areas. On the other hand, an extrapolation using land official use maps 1980, 1995, 2002, and 2009 shows that flood risk will increase by 45% [3].

While calculations based on available land use maps have shown the strength of the DKI Jakarta Regional Spatial Plan 2030, we suggest detailed regulations for presenting periodical land use maps including thorough guide on land use classes. This will provide site-based flood abatement programmes and, in general, will support spatial policy in Jakarta. Policy Brief 4 includes discussion how to implement the Jakarta Regional Spatial Plan 2030 inclusively from social, economic and environmental perspectives. Policy Brief 3 discusses spatial planning as it applies to the entire Greater Jakarta region under Presidential Regulation Number 60 of 2020 concerning Greater Jakarta Urban Spatial Plan.

The blue green city plan 2050

In November 2012, the government of DKI Jakarta and the Ministry of Public Works called for a competition on the 'Initiatives for Design and Planning of Jakarta Green Metropolis 2050' [25]. The winning concept was one that is based on the flood management system of Jakarta lowlands at the Kapuk Poglar and Kapuk Muara villages. Later in 2017, a high-resolution hydrodynamic model of the pilot area was prepared with the help of CTC-N/UNEP [26]. Although an ideal situation was used, it demonstrated that Jakarta is capable of producing soft measures to effectively reduce flood risk under differing climate and/or engineering scenarios. Policy Brief 2 includes a discussion on soft engineering (ecological) flood risk management measures, besides infrastructural engineering and social or institutional measures, while Policy Brief 4 includes some discussion about soft measures (referred to as nature-based solutions).

Recommendations and areas not yet covered

Building codes
Risk-based information can be beneficial for producing building codes. For example, assigning building use dependent on the flood risk characteristics of the region might result in recommending second storeys usage so that valuable items are not damaged during regular inundations. In Jakarta, measures are already being taken at the household level. Formal guidance by the government of Jakarta will enable these measures on a larger scale.

Sufficient water availability
Synthesis of water production sources available in reports by PAM Lyonaise Jaya (2012) and Aetra Air Jakarta (2014), showed Jakarta will require an investment of approximately USD 389 million to fill in the remaining 61.1% of water production that has not been sufficiently supplied by the two water corporates. Although this is a large investment, it is almost equal to the risk per annum resulting from land subsidence (USD 421 million). In other words, improving the water supply appears to be less costly than the potential damages resulting from long term ground water extraction that has been practised so far. Indeed, strict regulations on groundwater pumping (accompanied by the supply of alternative water sources) have effectively reduced land subsidence for large cities such as Bangkok [27] and Tokyo, [28,29], as well as many other cities that have successfully overcome rapid land subsidence.

Private partnerships
The flood risk data and maps are also of interest for the insurance industry since they could be used as a basis for developing a flood insurance market. At present, flood insurance is merged with fire insurance in Jakarta.

Appendix

In addition to the flood hazard model used in this study, other models that share the same objective can be used and developed further by the government. The table below lists examples of free/open-source flood hazard model softwares found to date [30].

Author(s), Date	Model name	Model type & dimensionality	Main assumption	Strengths	Limitations
Army Corps of Engineers (ACOE) (1995)	HEC-RAS	1-D Hydraulic	One dimensional energy the equation for steady flow and shallow water equation for unsteady flows.	Suitable for a wide range of data quality, easily adaptable and set up.	Model instability and limitation in environments that require multi-dimensional modelling.
Army Corps of Engineers (ACOE) (1995)	HEC–HMS	Hydrologic	To simulate the precipitation run-off process of drainage basins.	Suitable for a wide range of hydrologic applications and amenable for integration with other software.	Would generally fail under dynamic flood simulation conditions.
Halcrow (now CH2M HILL) (2009)	ISIS- FREE	Coupled 1-D/2-D Hydraulic	Provides an advanced one-dimensional (1D) and two-dimensional (2D) simulation engine, analysis and visualisation tools.	Suitable for a wide range of applications including urban areas, coastal and river channels.	Limited to 250 1D nodes and 2500 2D cells.
Bates and De Roo (2000)	LISFLOOD-FP	Simplified 2-D	A raster-based hydraulic model that is assumed to possess the simplest hydrologic process representation.	Easily adaptable and simple to set up.	Requires a high-resolution topographic data for simulation.
De Roo, A.P.J., Wesseling C.G. and Va Deursen, W.P.A. (2000)	LISFLOOD	GIS-based distributed hydrologic model	A GIS-based hydrological rainfall-runoff-routing model.	Wide range of applications including simulation of interception of rainfall by vegetation, evaporation of intercepted water and leaf drainage.	Not a stand-alone code. It requires a base platform of PCRaster modelling environment.
Électricité de France. (EDF) (2010)	TELEMAC	2-D	Designed to process representation and limitations in channel and floodplain flood modelling.	It can perform simulations in transient and permanent conditions.	Conditional stability.
Électricité de France (EDF) (2010)	TELEMAC	3-D	To address some limitations inherent in the 2-D version of the model.	Ability to capture 3-D hydrodynamic features of an area. Suitable for all flood sources.	Conditional stability

Author(s), Date	Model name	Model type & dimensionality	Main assumption	Strengths	Limitations
Martin and Gorelick (2005)	MOD_freeSURF 2D	2-D	To obtain a more efficient flood simulation through a more robust numerical scheme.	Modularity, computational efficiency, and minimum data requirement.	Lacks extensive validation.
Ghimire et al. (2013)	CADDIES	2-D	Performs optimally at simulating flooding in urban areas.	Fast simulation of flooding.	Lacks extensive validation.
Chen et al. (2009)	GUFIN (2009)	Simplified model	Simplifies the use of distributed models for urban environment.	Integrates GIS and quite suitable for urban flooding. Results compares well with numerical codes.	Lacks extensive validation.
Fu et al. (2019)	SWMM, new versions. USEPA (1971–2005)	Generic	Designed to represent six majors' environmental components: external forcing, surface runoff, groundwater, conveyance system, contaminant built-up and (LID) controls.	Several upgrades and adaptive to a range of hydrological and hydraulic operations -urban flooding, drainage, etc.	The model required many add-ons, and a user needs to understand the detailed guideline.
Meinhardt (2017)	J2000-Flood	Hydrological model and conceptual flooding	To simulate the hydrological process of drainage basins and to simulate floodplain/wetland inundation within the model.	Suitable for a wide range of hydrologic applications and conceptual flood inundation.	Does not consider hydrodynamics processes.
Sayama et al. (2012)	RRI	2D based on rainfall/runoff	Two-dimensional model capable of simulating rainfall-runoff and flood inundation.	The model deals with slopes and river channels separately.	Limitations in the representation of complicated flood hydraulic phenomena (building structures, detailed cross sections of rivers, sewerage/ drainage networks.
Mungkasi et al. (2013)	ANUGA Hydro	Triangular 2D mesh	Hydrodynamic modelling, suitable for predicting the consequences of hydrological disasters such as riverine flooding, storm surges and tsunamis.	Suitable for riverine flooding, storm surges and tsunamis.	Unsuitable for modelling flows in areas larger than one and half UTM zones (9 degrees wide).

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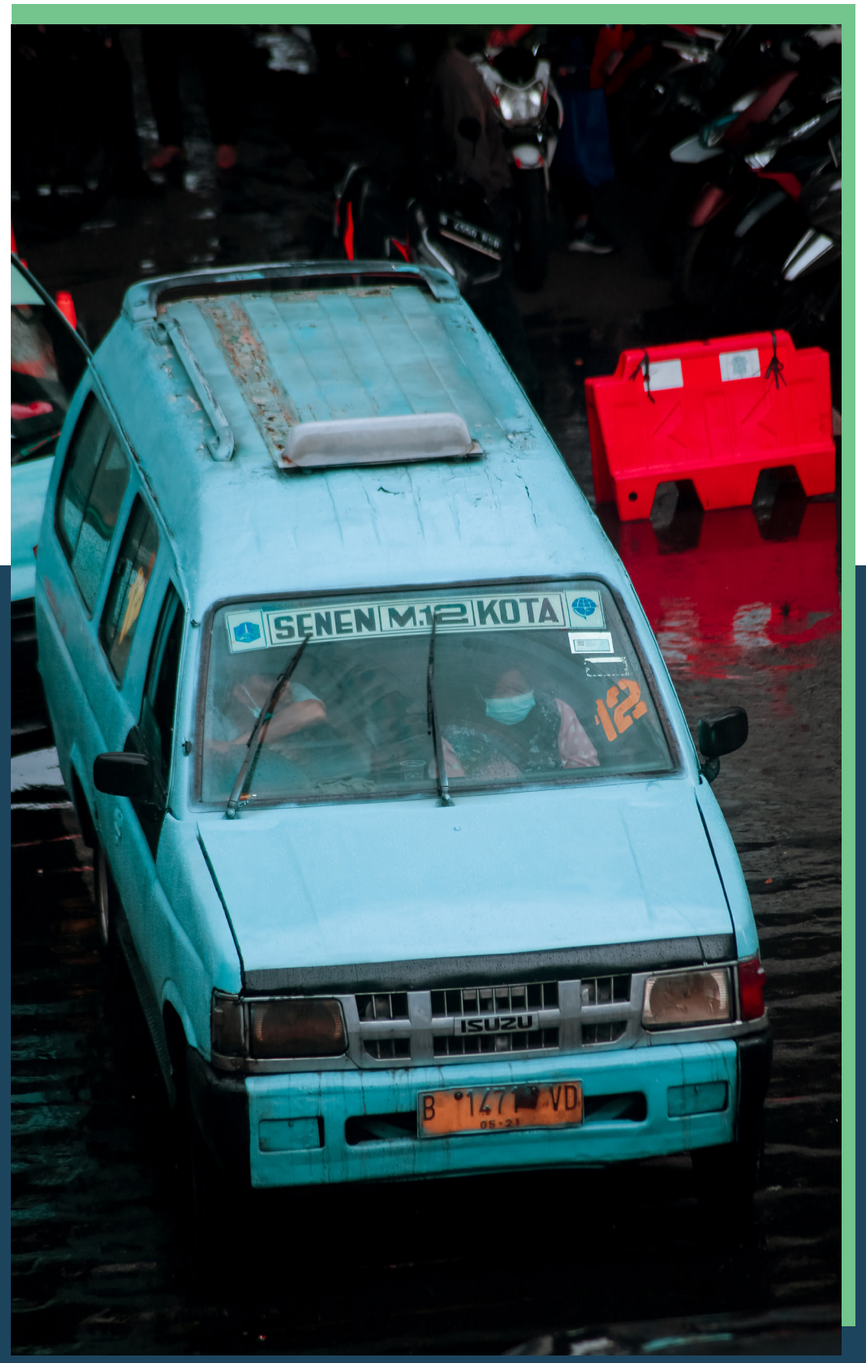

POLICY BRIEF 2

Alternative Measures for Flood Risk Management in Jakarta

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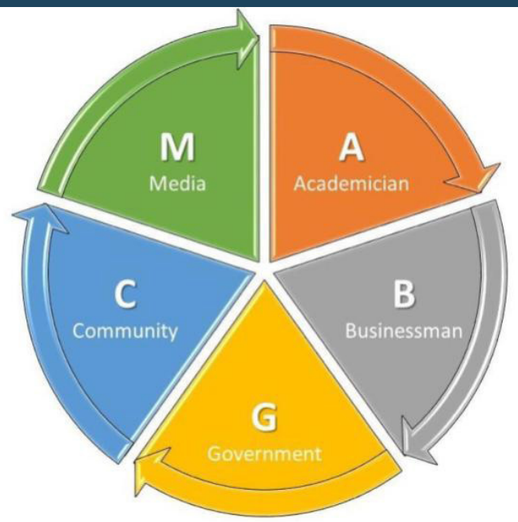

Fig. 2.1 Penta helix synergy between the ABCGM stakeholders.

Executive Summary

This Policy Brief is based on the results of studies on flood risk management (FRM) measures in Jakarta. As Jakarta is part of the Ciliwung watershed, this study includes Greater Jakarta, known in Indonesia as JABODETABEK-PUNJUR. This area is part of the Ciliwung-Cisadane watershed that has upstream, middle and downstream interactions. We firstly evaluate the currently predominant FRM approach. We then propose two alternative areas of action: the use of ecological (green) engineering and of social and institutional engineering. This Policy Brief recommends that the infrastructure approach needs to be accompanied by an integrated ecological and socio-institutional approach through a penta helix synergy between the ABCGM stakeholder types: Academics, Businesses, Community, Government and Mass Media (Fig. 2.1).

Introduction

Jakarta is naturally prone to flooding as it is built on a river delta. Major floods of the last decades have periodically occurred in 1997, 2002, 2007, 2013, 2015, 2020 and 2021. The 2007 flood was the biggest in Jakarta's history as it reached more than 60% of the capital's area, resulted in 79 deaths, caused the evacuation of 500,000 people and a cost of flood damage of around nine trillion Indonesian Rupiahs.

Flooding in Jakarta has three combined causes: high rainfall intensity in the Jakarta area itself, runoff from upstream areas and high tides (also known as rob floods). In addition to this, global climate change affects the intensity of rain and land subsidence in Jakarta and increases the risk of flooding (Policy Brief 1). Several policies and activities have been taken by both the local and central governments to reduce the risk of flooding in Jakarta.

Several policies and activities have been taken by both the local and central governments to reduce the risk of flooding in Jakarta. However, the activities are on a project-by-project basis, rather than using a holistic planning approach that refers to a short-medium-long term road map.

However, the activities are on a project-by-project basis, rather than using a holistic planning approach that refers to a short-medium-long term road map. This Policy Brief is based on studies that reveal that there is an urgent need for an integrated flood policy. The implementation of such a policy must consistently follow a roadmap and be implemented by all stakeholders according to their respective roles through a so-called Penta helix synergy. An independent authority can be established for the management of flood risk mitigation and adaptation in the JABODETABEK-PUNJUR region, funded by the State Revenue and Expenditure Budget (APBN) and a contribution from the Jakarta Regional Revenue and Expenditure Budget (APBD). To ensure sustainability, the proposed authority should be strictly supervised and audited.

Key Messages and Recommendations

- To reduce the risk of flooding in Jakarta, policies and activities have been taken by local and central governments. However, most activities are on a project-by-project basis, rather than using a holistic planning approach that refers to a short-medium-long term road map.
- This Policy Brief is based on studies that found that there is an urgent need for an integrated flood policy. The Brief firstly evaluates the currently predominant FRM approach that mainly consists of infrastructural measures including river alignments ('river normalisation') and the construction of canals and river embankments.
- The Brief then evaluates two alternative areas of action. Firstly, the use of ecological (green) engineering (including holistic spatial evaluation measures) to overcome the threat of flooding from upstream, to deal with large volumes of rain in a relatively short time ('river naturalisation') and to confront tidal waves threats.
- Furthermore, the use of social and institutional engineering (soft engineering) to establish an independent institution for planning, implementing, monitoring and evaluating flood management at the watershed scale, including community-based activities with environmental and nature-friendly nongovernmental organisations (NGOs) and other stakeholders. Social engineering actions involve producing leaflets, posters and banners and books on mitigation and adaptation to flood hazards and risks and initiating flood insurance for flood-affected communities.
- **Recommendation:** The infrastructure approach needs to be accompanied by an integrated ecological and socio-institutional approach through a so-called penta helix synergy between the ABCGM stakeholder types: Academics, Businesses, Community (individuals and groups), Government (both central and regional) and Mass Media (both print, electronic and social media) (see Figure 2.1).

Objectives

This Policy Brief has two aims:
1. To enable stakeholders to follow up on the results from studies on existing flood risk reduction measures in Jakarta.

2. To propose two alternative actions (ecological and social measures) to be implemented in the form of policies (laws, government regulations, presidential decrees, governor decrees, regional regulations, and other policies). These policies should be followed by good governance and effective budgeting by the government.

Evaluation of existing measures infrastructures

An infrastructural approach is the main measure adopted by the Provincial Government of Jakarta to reduce flood risk in the capital city. This approach involves the construction of physical structures such as embankments to control rivers and protect an area. Such measures can have a rapid effect on reducing the inundation height and flooding in the affected area and therefore suits short periods of government. Policymakers tend to favour these policies, resulting in technological lock-in, making other alternatives less desirable or not thoroughly studied [1].

Many countries are starting to shift their flood risk management strategies from structural approaches, such as embankment construction, to non-structural measures, such as restricting development in the upper stream areas. A structural approach focused solely on water control, has the potential to disrupt the natural environment which can lead to unintended consequences, such as downstream flooding.

Infrastructures are still necessary for some stretches of the rivers in Jakarta but need to be accompanied by ecological and socio-institutional measures. Below we evaluate some of Jakarta's flood management infrastructures (Table 2.1).

River dredging in Sawah Besar, Central Jakarta (Liputan 6, 2020).

Table 2.1
Evaluation of flood management infrastructures in Jakarta

Infrastructure	Descriptions, Advantages, and Disadvantages
River straightening and dredging	River straightening can theoretically accelerate the river flow rate (velocity), resulting in a higher volume of water retained in the river. Dredging sediment from the bed and banks of the river allows the river to hold more water. **Advantages:** The river can hold more water; Flood risk is reduced in densely populated areas. **Disadvantages:** Frequent dredging is necessary; Accelerated river flow rate increases the risk of flooding in the downstream of Jakarta, even more so given significant land subsidence. River dredging should be a routine annual activity in Jakarta to ensure rivers can function at the optimal capacity.
Embankments	If an embankment is a raised, the given artificial bank enables a river to hold more water when needed. For areas that do not have embankments, the riverbanks accommodate excess water. **Advantage:** The river can accommodate more water. **Disadvantages:** The increased water velocity can increase the risk of flooding downstream; An embankment can block the flow of water into a river, such as seen in the Kampung Pulo and Bukit Duri areas; An embankment can provide a false sense of security for construction and developments on a floodplain; Water infiltration is reduced when riverbanks are covered with concrete or other impervious materials; Increased social friction can result from not involving the local community in the decision-making process. Embankment construction is closely related to river strengthening, also known as normalisation. The plan to normalise five rivers in Jakarta (Ciliwung River, Pesanggrahan River, Angke River, Sunter River, and Jati Kramat River) begins with land acquisition. Normalisation should only be considered for areas requiring urgent mitigation, not for all sections of Jakarta's rivers. • Socio-economic impacts, especially for people who depend on coastal resources, for example, fishing industries. Jakarta should increase clean water provision, currently the main cause of the high rate of land subsidence. In preparation for coastal flood risks, central and local Governments are currently repairing the existing 48.4km coastal sea wall.
Flood canals	Flood canals are channels designed to divert water from vital locations to areas that can absorb floodwater. Canals can also divert water to join rivers downstream. **Advantage:** Excess water diverted from river channels to reduce flooding. **Disadvantages:** Expensive to build; If the water level continues to rise, a canal can also overflow; Regular maintenance required, such as dredging; Increased risk of downstream flooding because of accelerated water flow. Jakarta has built the West Flood Canal and the East Flood Canal as drainage channels from upstream rivers to the sea. The plan is to construct another canal connecting Ciliwung River to the East Flood Canal to reduce flood risk along the Ciliwung River. In canal construction, it is necessary to consider the risk of flooding in the city holistically, especially in the lower reaches of Jakarta, which has experienced significant land subsidence.
Sea wall	A sea wall is a form of coastal defence to protect the coast from tides, waves and tsunamis. **Advantage:** Prevents beach erosion. **Disadvantages:** • Requires specialist maintenance; • High maintenance costs such as pumping water to the sea; • Potential of severe environmental impact;

An embankment in Kampung Melayu, Jakarta Timur (Kompas, 2017).

East Flood Canal in Duren Sawit, East Jakarta (Kompas, 2018).

Sea Wall in Muara Baru, North Jakarta (Kemen PUPR,2019).

Alternative Measures

Ecological measures

Ecological engineering, also known as nature-based solutions (Policy Brief 4), pays attention to the problem of spatially holistic flooding based on the hydrological cycle in a watershed system [2]. It involves a policy approach with the main focus on ecological and spatial aspects but also takes into account socio-cultural-spiritual and economic-business aspects.

A holistic approach views the hydrological cycle as of major importance in flood disaster management. This hydrological cycle pays attention to the relationship between green open space (GOS) and blue open space (BOS). Flood water can come from mountain surface runoff (upstream), from atmospheric evaporation and precipitation (rain) and from coastal rising tides (downstream).

This concept encompassing holistic, upstream, rain and downstream (HURD) underlies a policy of ecological engineering. HURD can be categorised in its own cycle by following certain theories and must be managed by selected institutions. Such a policy can be based on the categories of Strategy – Theory – Manager as presented in Table 2.2. Managers are defined here as organisations or government departments who are very well acquainted with the conditions in the field. Table 2.3 shares four strategies of an ecological engineering approach.

Institutional measures

Flood disasters are not solely caused by environmental and physical aspects but are also due to economic activities, the organization of flood-related institutions and the human response to flood events. In addition to infrastructural and ecological measures, flood risk management in Jakarta needs to involve institutional engineering. This approach has become increasingly popular globally, given the limitations of infrastructural and ecological approaches in dealing with flood disasters.

This Policy Brief proposes the following four institutional strategies to manage Jakarta's flood risks and disasters, further elaborated in Table 2.4.:

- **Strategy 1:**
  Establish an independent Flood Risk Management Agency
- **Strategy 2:**
  Establish a Public Engagement Environmental Group
- **Strategy 3:**
  Improve effectiveness of family emergency plans
- **Strategy 4:**
  Implement microinsurance for flooding

Strategies 1 and 2 are mitigating to reduce the risk and impact of flood disasters, to increase the effectiveness of planning and enhance the government's capacity to manage flood risks. Strategies 3 and 4 are curative to reduce the socio-economic impacts of floods when disasters occur. The below Table 2.4 provides further details on these four strategies.

Table 2.2
An ecological engineering policy can be based on the Strategy-Theory-Manager concept

Source of Flood Risks	Strategy	Theory	Manager
Water in hydrological cycle	Holistic	Thermodynamic	Ministry of Environment and Forestry (KLHK)
Water from runoff	Upstream	Watershed	Head Office of Ciliwung and Cisadane River (BBWSCC)
Water from precipitation	Rain	Water Balance	Ministry of Public Works and Housing (PUPR)
Water from rising tides	Downstream	Gravity	Meteorological, Climatolgical and Geophysical Agency (BMKG)

Table 2.3
Four strategies according to an ecological engineering concept

Strategy 1. **Managing watershed in holistic perspective** • Spatial planning for the watershed system through ecological engineering by increasing carrying capacity of drainage system master plan; • Implementing environmental technology 4.0 from micro to macroscale by monitoring any climate change circumstances; • Coordination of ecological movement from Penta helix stakeholders ABCGM by involving bottom-up forces.	**Strategy 2.** **Managing flood disaster from upstream** • Water retention for parking material from surface runoff before being released [2]; • Moratorium on land conversion for protected areas through green and blue open space management; • Horizontal penetration of water for slowing down water flow by naturalisation and meandering rivers.
Priority: Institutional in terms of implementing coordination and leadership to conduct policies holistically.	**Priority: Investment** in developing conservation areas and infrastructure to slow down the water flow.
Strategy 3. Managing flood risk from rain • Early warning system for predicting heavy rainfall; • Mitigation by draining rain on the oceans since weather forecasts are getting more accurate; • Adaptation by accelerating percolation and infiltration through some applied approach such as bio retaining wall infiltration wells [3] [4].	**Strategy 4. Managing flood risk from downstream** • Developing mangrove buffer with ideal dimension for wetland management system; • Implementing water retention technology and biofilter engineering through artificial polder system [3] [5]; • Spatial planning with green and blue open space through watershed revitalization for providing public space security [6].
Priority: Spatial technology in terms of developing early warning systems and mitigation/adaptation fore forecasting the amount of rain.	**Priority: Conservation** in terms of raising awareness and policies to protect coastal boundaries.

Table 2.4
Four institutional strategies to manage Jakarta's flood risks and disasters

Institutional Strategies	Description
Strategy 1	Establish an independent agency with sufficient authority and funding to design, regulate and oversee an integrated flood risk management at a catchment scale. This agency will have the following set-up and focus areas: • Composed of representatives from various local and national government institutions, academics, and NGOs, ideally with a higher proportion of academics and NGOs; • Adopt a different organisational cycle to either local or national governments • Adopt the concept of the 'Delta Commissariat' institution in the Netherlands [7]; • Collaborative management with the governor's leadership and support from the central government (see also Policy Brief 5) [8]; • Adopt local programs such as in Citarum Harum (Presidential Regulation No. 15 of 2018 concerning Acceleration of Pollution and Damage Control of Citarum Watershed); • Enable ecoregional coalitions (see also Policy Briefs 3, 4 and 5) by involving existing institutions, such as Head Office of Ciliwung and Cisadane River (BBWSCC), to ensure coherent planning between institutions in different administrative areas. The idea of creating an independent institution has been echoed for a long time but never implemented due to, among other things, the political-economic conditions of the institutions involved. Consistent and implementable policies are needed, despite changes in central and local government leadership.

Institutional Strategies	Description
Strategy 2	Public engagement: Environmental Group to encourage public participation in flood risk management planning. This group will have the following set-up and focus areas: • Members consists of residents, academics, and organisers; • Adopt an institutional approach that needs to be adapted to the context of JABODETABEK-PUNJUR; • Regular meetings aimed at co-production of information and knowledge between residents and academics; • Crucial issues discussed including efforts to reduce flood risks and other environmental problems such as preventing water pollution caused by waste entering bodies of water. In addition, taking firm action against companies that illegally dump industrial waste into bodies of water (The environmental scope of this group goes beyond flood disasters); • Discuss other mitigation activities, including the design and construction of affordable flood-resistant houses (as applied in Kelapa Gading). • Implement a dissemination plan to share information and knowledge to local residents. The JABODETABEK-PUNJUR area has an active group of environmental NGOs. However, their programmes need to be synergised with those of the central and local governments.
Strategy 3	Family emergency plan aimed at residents living in flood-prone areas with the following set-up and focus areas: • Readily available practical handbook on how to behave or what to do when a flood occurs; • Handbook customised for each sub-district; • Incorporate in the public education curriculum, especially for the younger generation, environmental content (such as an understanding of flood disasters and introduction to river landscapes). The Jakarta government has already created Family Emergency Plans, but their distribution and socialisation are still very limited.
Strategy 4	Microinsurance to address the economic impacts of flooding for households. This would have the following set-up and focus areas: • A flood insurance scheme targeted at the poor, especially those living in flood-prone areas; • Integrate with the temporary unconditional cash transfer concept (Bantuan Langsung Tunai) that has been done by the central or regional government; • While the flood insurance scheme is primarily intended to reduce the financial impact of floods on the poor, actions to increase awareness and knowledge of flood disasters should be formulated for all levels of society. This insurance concept is similar to the compensation offered to residents affected by flood disasters.

Conclusion and Recommendation

The current infrastructural measures implemented in Jakarta have not been effective to manage flood risks, with some disadvantages outlined above. Flood mitigation efforts need to merge infrastructure, ecological and institutional measures. Specifically, normalisation (infrastructural approach) and naturalisation (ecological approach) must be applied simultaneously, along with institutional reform, enforcement of existing rules and public involvement in flood risk mitigation. We hope that our recommendation in this Policy Brief could be useful for relevant policymakers and be followed up as city/ regional policies to reduce flood risks in the city.

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POLICY BRIEF 3

Towards an Adaptive Spatial Planning Policy for Flood Risk Management in Greater Jakarta

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Thanti Octavianti

Executive Summary

Potential strategies for reducing flood disaster risk in Greater Jakarta are varied and multidimensional. A spatial planning policy is one strategy. Two main prerequisites of successful flood prevention using spatial planning are:

i. consistency between planning, utilisation and control of space utilisation;
ii. spatial plan development that is based on an analysis of a particular ecoregional area, while acknowledging the stakeholders who need to respond to unexpected outcomes.

This Policy Brief reviews flood adaptation and mitigation efforts pursued by Presidential Regulation No. 60 of 2020. It provides recommendations for implementing the Presidential Regulation in order to realise adaptive spatial planning for reducing flood risk in Greater Jakarta.

Introduction

The impact of land-use change plays a more important role than the impact of climate change in increasing water overflow and river sedimentation in Greater Jakarta. This is why spatial planning, as part of flood mitigation efforts, is important in controlling land-use change.

The Greater Jakarta area is the second-largest metropolitan area after Tokyo, with a population of 31.24 million in 2020 [1]. Demographically, the area was home to 35.53 million people in 2020 [1] and is projected to accommodate around 75.6 million people in 2039 [2]. By 2030, the area is projected to grow into the largest metropolis in the world with a population of 35.6 million and a GDP ranking 23rd globally [3]. The area stretches over three provinces, namely DKI Jakarta, part of West Java and part of Banten and occupies 7117.73 km^2 [4]. The area is designated a strategic area in the National Spatial Plan, RTRWN (Rencana Tata Ruang Wilayah Nasional). Economically, Greater Jakarta contributes 19.93% to the GRDP (National Gross Regional Domestic Product) with an economic growth rate of 5.01% in 2017 [4].

The designation of Greater Jakarta as a national strategic area brings with it an environmental burden. Flooding is one indication that the environment's carrying capacity has been exceeded. Greater Jakarta's built-up area has rapidly increased due to economic growth and rapid urbanisation. This has led to a decrease in green open spaces and water catchment areas. Historical data of the upstream area recorded by Forest Watch Indonesia (FWI) reveals that around 5,700 ha of forest in the Puncak area were lost between 2000-2016. In the downstream area (DKI Jakarta), 3,925 hectares of DKI Jakarta's water catchment areas and urban forests were lost between 1985-2006 [5].

Key Messages and Recommendations

There is no single cause of flood disaster in Greater Jakarta and potential strategies for flood disaster reduction are varied and multidimensional.

- There is no single cause of flood disaster in Greater Jakarta and potential strategies for flood disaster reduction are varied and multidimensional. A spatial planning policy is one strategy.

- Main prerequisites for successful flood prevention using spatial planning are:
  1. consistency between planning, utilisation and control of space utilisation;
  2. spatial plan development that is based on an analysis of a particular ecoregional area, while recognising the stakeholders who need to respond to unexpected outcomes.

  It should also use the results of a watershed-based flood risk assessment and projected future climate data as per the Strategic Environmental Assessment (KLHS) document.

- This Policy Brief reviews flood adaptation and mitigation efforts pursued by Presidential Regulation No. 60 of 2020 and provides recommendations for implementing the Regulation in order to realise adaptive spatial planning for reducing flood risk in Greater Jakarta.

- Successful and effective implementation of Presidential Regulation No. 60 of 2020 depends on the operationalisation of the Regulation at the provincial and regency/city levels. In particular, the elaboration of the Greater Jakarta urban spatial plan into more detailed spatial plans at these levels. Also, the implementation of mitigation and adaptation programmes should consider future climate projections of flood risk.

- The Policy Brief's recommendations are as follows:

  1. Revision of technical guidelines for environmental physical analysis in the process of preparing spatial plans.
  2. Revision of provincial and district/city spatial plans in the Greater Jakarta area referring to Presidential Regulation No. 60 of 2020.
  3. Strengthening of governance and institutions:
     a. Capacity building of planners for environmental carrying capacity analysis;
     b. Increasing the capacity of government officials in controlling the use of space;
     c. Law enforcement against violations of spatial plans.
     Strengthening and implementing the Indonesian one data system to encourage the availability of data and information for spatial planning in support of an evidence-based policy.
  4. Development of mechanisms and/or instruments for rewarding ecosystem services between local governments in the Greater Jakarta area to maintain urban green spaces and protected areas as water catchment areas.

Many studies show that there is no single cause or solution to flooding. Research done by Poerbandono et al. 2014 [6] concluded that the impact of land-use change plays a more important role than the impact of climate change in increasing water overflow and river sedimentation in Greater Jakarta. This is why spatial planning, as part of flood mitigation efforts, is important in controlling land-use change [7].

Spatial planning includes efforts to regulate, develop, implement, and monitor spatial plans. In implementing spatial planning, there is a unified system between spatial planning, space utilisation and its control (Law No. 26 of 2007). There is also a need for a participatory and adaptive approach to planning. The legal basis for spatial planning for the Greater Jakarta area is stipulated in Presidential Regulation No. 60 of 2020 which replaces Presidential Regulation No. 54 of 2008. The new regulation acts as a tool for the operationalisation of the National Spatial Plan and a tool for coordinating the implementation of development in the Greater Jakarta urban area (Article 4 of Presidential Regulation No. 60 of 2020).

This Policy Brief aims to provide recommendations for flood disaster management in Greater Jakarta by implementing Presidential Regulation No. 60 of 2020. The regulation is a means to coordinate the implementation of development efforts in the Greater Jakarta urban area. The objectives of this Policy Brief are as follows:

1. Capture root causes of flooding in Greater Jakarta.
2. Review Presidential Regulation No. 60 of 2020 concerning the Greater Jakarta Urban Area Spatial Plan, particularly regarding flood adaptation and mitigation.
3. Provide recommendations on how to translate the strategy of Presidential Regulation No. 60 of 2020 concerning the Greater Jakarta Urban Area Spatial Plan and concrete efforts to mitigate and adapt to floods, while taking into account the participatory and adaptive approach.

Spatial Planning for Greater Jakarta Area and its Relation to Flood Mitigation and Adaptation Efforts

Root cause of flood problems in DKI Jakarta

Annual floods in the Special Capital Region (DKI) Jakarta, are caused by various factors. In addition to extreme rainfall, floods may result from choices made by the Central and Regional Governments in Greater Jakarta within development policies such as land use (Policy Brief 4). Root cause analysis and proposed solutions need to consider ecological, social, economic, cultural and institutional aspects in a cross-spatial-temporal context. Spatially, this analysis needs to be carried out based on ecoregional perspectives that go beyond the administrative boundaries of DKI Jakarta.

Temporarily, analyses need to consider the impact of economic losses due to environmental damage, which might be borne by future generations. This is the basis for using a watershed-based approach and climate data predictions to identify the distribution and extent of flood inundation in the area (Policy Brief 1) as well as formulating recommendations for solutions through various mitigation and adaptation efforts (Policy Brief 2).

Flood risk is determined by a combination of three elements: hazard, vulnerability and exposure [7, 8, 9, 10,11]]; see also Policy Brief 1. These three elements are affected by the biophysical-environmental, social, economic and political aspects of an area (ibid.). Flood hazards in the river delta of DKI Jakarta can be categorized into three types: tidal flooding, fluvial flooding, and pluvial flooding [9, 10]. Tidal flooding, locally known as rob flooding occurs due to tidal conditions and can be exacerbated by land subsidence in coastal areas. Fluvial flooding occurs when extreme rainfall occurs over a long period and exceeds the river's holding capacity. Pluvial flooding is due to rainwater surface runoff.

All three result from changes in natural conditions, the natural environment or from human activities (9, 10). These changes can be in the form of increased rainfall due to climate change, river sedimentation and subsidence (see also Policy Brief 1). The level of exposure and vulnerability to flooding of a given area results from the social, economic, cultural and regional governance context (see Policy Briefs 1, 4 and 5).

The presence of built-up areas in floodplains in DKI Jakarta can indicate the level of exposure. Some built-up areas in Jakarta have names that indicate an area was originally flooded swampland. In DKI Jakarta, people of a lower middle income living in flood-prone areas are more vulnerable to flooding. Various socio-economic aspects can affect the level of exposure and vulnerability to floods, which may drive particular governance issues [12, 13]. This is discussed in Policy Brief 1.

Kali Cideng in front of Rasuna Epicentrum
Photo by: Wiwi Tjiook

The various and possibly interdependent causes of flooding in DKI Jakarta have implications for the different demands on flood management (Policy Brief 2). These demands take the form of flood mitigation or adaptation efforts in addressing specific root causes. Spatial planning is one of the efforts that can significantly address this complexity in the Greater Jakarta area as it is integrated and also applies ecoregion-based management. The flood problem in DKI Jakarta is not solely a responsibility of the DKI Jakarta Government, but a joint problem between the Central and Regional Governments in Greater Jakarta and other stakeholders (communities, NGOs, businesses and residents) (See Policy Briefs 4 and 5). They all have their roles to play with a balanced responsibility between their respective rights and obligations in flood management. In this way, the Greater Jakarta area is viewed as an ecosystem unit whereby its spatial planning plays a central role in flood mitigation and adaptation.

Flood mitigation and adaptation efforts pertaining to Presidential Regulation No. 60 of 2020 concerning Greater Jakarta Urban Area Spatial Plan

Presidential Regulation stipulates the use of the Grey, Blue and Green infrastructure development plans as an effort to mitigate and adapt to floods, especially in the downstream area of DKI Jakarta.

Spatial plans can contain a variety of flood mitigation and adaptation efforts. Efforts integrated into spatial patterns and structures, provide indications for space utilisation programmes or directions for controlling space utilisation e.g., zoning regulations. Flood mitigation efforts that consider the water catchment areas can be incorporated into spatial patterns for provisioning and/or the delineation of protected areas. Protected upstream forests and nature areas can function as water catchment areas. Green open spaces can provide this in middle and downstream areas. The provision of green open spaces as catchment areas can be incorporated into the directives of zoning regulations, particularly regarding the space use intensity. This is represented by the basic building coefficient and green basic coefficient of a given land parcel. Flood adaptation efforts can also be realized through a spatial structure such as flood control infrastructure of reservoirs, dams, canals, drainage networks and the provision of waste management infrastructure. Space utilisation programmes such as river sedimentation dredging programmes and integrated waste management could enhance flood adaptation. Regarding zoning regulations, flood adaptation can be integrated into provisions concerning building codes in flood-prone areas. For example, provisions for building houses on stilts in flood-prone areas [14].

In Presidential Regulation No. 60 of 2020, flood management is given in the context of a spatial pattern that views the Greater Jakarta region as an integrated "upstream-middle-downstream-coastal" area [15]. The upstream area is both a protected area and a water source, while the middle area acts as a buffer and a water catchment area. In spatial pattern terms, the two areas are designated as protected and limited cultivation areas. Furthermore, the downstream area functions as cultivation area, which in spatial pattern terms is designated for the development of cultivation activities for the purpose of development and economic growth. Meanwhile, coastal areas include protected areas and cultivation areas or in spatial pattern terms indicated as marine protected areas and limited aquaculture areas.

There are various plans related to flood adaptation and mitigation in Presidential Regulation No. 60 of 2020. These are categorised as Grey, Blue and Green infrastructure development plans spread over three provinces, five cities and five districts in the Greater Jakarta spatial structure and pattern plan. The Grey infrastructure plan aims to build five canals and coastal embankments along the coastal area, normalize 13 main rivers, construct drainage networks connected to 13 main rivers, and improve coastal security and offshore connectivity. The Blue infrastructure plan concerns 305 river, lake and reservoir points, a reduction on the Presidential Decree No. 54 of 2008 which had 525 river, lake, and reservoir points. The Green infrastructure plan is a protected area plan covering 54,791 hectares of conservation areas, geological protected areas, local protected areas (rivers, lakes, roads and borders), areas that provide protection for their subordinate areas and other protected areas including open green space. This is a reduction of 14,479 Ha in the designated protected area initially stipulated in the Presidential Regulation No. 54 of 2008 (69,270 Ha) [16].

The use of the Grey, Blue and Green infrastructure development plans as an effort to mitigate and adapt to floods is quite comprehensively stipulated in the Presidential Regulation, especially in addressing the risk of flooding in the downstream area of DKI Jakarta. The Grey infrastructure development plan is more predominant than the Blue and Green infrastructure plans. The implementation of the Green infrastructure plan in the allocation of green open space needs a more detailed operational spatial plan that shows the distribution of locations. In addition, it is not yet known whether the Green plan has considered the involvement of the community and other stakeholders, especially in regard to the issue of conflicts with settlements and relocation issues (see Policy Brief 4). It is also not clear if the Green plan considers the results of a watershed-based flood risk assessment and future climate change projections. The importance of this lies in ensuring that the various flood mitigation and adaptation plans can respond to the complex and uncertain future requirements due to climate change.

Presidential Regulation No. 60 of 2020 has also established the idea of a five-year central programme of various spatial utilisation programmes in accordance with the determined plans and patterns of spatial structure. In addition, there are directions given for controlling the use of the area as a whole in zoning regulations, licensing, incentives, disincentives and sanctions.

However, these existing mechanisms need to be strengthened by more operational actions to ensure the effectiveness of the mitigation and adaptation efforts. One such action is the revision of the provincial and district/city regional spatial plans (Rencana Tata Ruang Wilayah (RTRW)) in the Greater Jakarta Area to be adjusted to Presidential Regulation no. 60/2020, as well as preparing detailed spatial plans (Rencana Detail Tata Ruang (RDTR)) and zoning regulations (or Peraturan Zonasi (PZ)) in each district/city as a form of operationalisation of the RTRW.

The key to success of the flood mitigation and adaptation efforts in spatial planning for the Greater Jakarta Urban Area

The consistency of the content of spatial planning from the national, provincial and district/city levels is needed to ensure the effective implementation of mitigation and adaptation as stipulated in Presidential Regulation No. 60 of 2020.

Various flood mitigation and adaptation efforts using spatial planning can be carried out effectively if there is consistency between planning, utilisation and control of space utilisation.

Agricultural area in the upstream of Ciliwung River, Photo by Said Abdullah, 2016.

In addition, analysis during the preparation of spatial plans needs to be carried out based on a participatory and adaptive approach, which considers ecoregion areas and the results of future flood risk studies. The watershed in the ecoregion is a unified system whose planning and management need to be integrated. Meanwhile, the results of flood risk studies through watershed-based hydrological modelling and future climate change projections can show the spatial distribution of flood risk. These analyses can be useful to determine the types of flood mitigation and adaptation efforts in the spatial plan (spatial structure and pattern, the space utilisation programme, and spatial use control directions).

The analysis done in the preparation of spatial plans is currently carried out based on administrative areas. Technical guidelines for analysing physical and environmental aspects in preparing spatial plans do not yet contain an analysis method based on ecoregions. In addition, watershed-based flood risk studies using future climate projection data have not been used in preparing spatial plans in Indonesia. The current flood distribution map only contains information on historical flood events, not information based on the results of hydrological modelling analyses and consider future climate projection data. In addition, not all districts/cities have large-scale (historical) flood maps. The mandate to consider flood risk in preparing spatial plans is included in the Strategic Environmental Assessment (KLHS), namely vulnerability and adaptation capacity to climate change. KLHS is the mandate of Law No. 32 of 2009 for every formulation of policies, plans and programmes, including spatial plans. The use of space needs to follow a predetermined spatial plan. Spatial plan violations need to be dealt with using appropriate measures, and efforts made to restore the function of the protected area. Violations of spatial use in protected areas are often dealt with using fines without restoring the protected areas. In addition, new spatial plans are often used to remedy existing spatial violations [5].

The consistency of the content of spatial planning from the national, provincial and district/city levels is needed to ensure the effective implementation of mitigation and adaptation as stipulated in Presidential Regulation No. 60 of 2020. The RTRW at the provincial and regency/city levels in Greater Jakarta needs to be revised to conform to the contents of Presidential Regulation No. 60 of 2020. It is also necessary to prepare RDTR and PZ at the regency/city level as a form of operationalisation of the RTRW. RDTR and PZ are the basis for issuing location permits for various development activities. Their existence is the key to the use and control of space utilisation.

Implementation of flood mitigation and adaptation efforts stipulated in Presidential Regulation No. 60 of 2020 can be implemented effectively if followed by operational actions.

Regarding mitigation efforts, the allocation of protected areas (in the Provincial and Regency/City RTRW and Regency/Municipal RDTR and PZ in Greater Jakarta) needs to consider the unity of the ecological area so that management can be integrated based on the watershed. Therefore, a strong commitment is necessary between the provincial and district/city governments for maintaining protected areas. The mechanism for rewarding environmental services between local governments can ensure the sustainability of protected areas from upstream to downstream. This requires a comprehensive study to find out information about the economic value of ecosystem services and the value of losses due to flooding in Greater Jakarta.

Meanwhile, the incentive-disincentive mechanism in the spatial planning instrument uses building rights transfers and bonus zoning. These can be used fairly and proportionally for the implementation of flood mitigation. The transfer of development rights can restore and preserve ecosystems in water catchment areas by providing fair and appropriate compensation for landowners (private and community-owned). This can deter them from using their development rights. Zoning bonuses can be made available to private and public building constructors who are permitted to exceed the building floor height requirements, as long as the building owners create green open spaces in locations that meet the needs of flood mitigation and/or adaptation.

Regarding adaptation, various flood control infrastructure plans need to be integrated and connected between service scale hierarchies (primary, secondary and tertiary) and be able to overcome the distribution of inundation and flood risk in the future. The plan for the construction of five canals, embankments, drainage networks, and river normalization in the downstream area needs to consider the capacity required to accommodate future flood inundation in accordance with the results of watershed-based risk assessments and future climate projections. In addition, in flood-prone areas, it is necessary to establish building codes that regulate the provisions for the construction of houses on stilts or other forms of flood-resistant construction. This can be stated in zoning regulations at the district/city level.

The various efforts mentioned in the previous paragraphs need law enforcement to deal with both spatial planning control and violations. Improvement is needed in the coordination and collaboration between provincial and district/city governments and related sectors improvement in this area (Policy Brief 5). The capacity of regional law enforcement in controlling the use of space is important (Policy Brief 5) and needs support from spatial and non-spatial data at an adequate scale. Data and information governance needs to pay attention to the access and usability of data users so that decisions can be made using valid data (evidence-based policy). The successful implementation of the Presidential Regulation based on the Indonesian one data system is very important.

Recommendations

The following recommendations and policy implications are based on the results described in this Policy Brief:

- Revision of technical guidelines for environmental physical analysis in the process of preparing spatial plans that refer to the method of analysis based on ecoregions rather than administrative areas and/or prepare technical guidelines for analysis of environmental carrying capacity including analysis of future climate change risks.
- Revision of provincial and district/city spatial plans in the Greater Jakarta area while referring to Presidential Regulation No. 60 of 2020 (This refers to the environmental carrying capacity analysis guidelines in point 1).
- Strengthening of governance and institutions, particularly in terms of:
  a. Capacity building of planners for environmental carrying capacity analysis;
  b. Increasing the capacity of government officials in controlling the use of space;
  c. Law enforcement against violations of spatial plans.
- Strengthening and implementing the Indonesian one data system to encourage the availability of data and information for spatial planning in support of an evidence-based policy.
- Development of mechanisms and/or instruments for rewarding ecosystem services between local governments in the Greater Jakarta area to maintain urban green spaces and protected areas as water catchment areas.

Conclusion

Lack of Green Spaces in the City Contributes to Flood
The conversion of green spaces into built-up land is a more predominant cause of flooding in DKI Jakarta than high rainfall. Spatial planning instruments therefore have a strategic and significant role in preventing floods through mitigation and adaptation efforts.

Spatial Planning Could Help for Flood Mitigation
The two main prerequisites for the success of flood prevention through spatial planning are:

- Consistency between planning, utilisation and control of space
- utilisation;
- A spatial plan should be based on the analysis of the eco-regional area that acknowledges stakeholders who need to respond to the unexpected outcome. It should also use the results of a watershed-based flood risk assessment and projected future climate data as per the Strategic Environmental Assessment (KLHS) document, mandated by Law No. 32 of 2009.

Integrated Flood Management Plays a Crucial Role
Flood management in Presidential Regulation No. 60 of 2020 is determined through the concept of a spatial pattern that views Greater Jakarta as an integrated area of "upstream-middle-downstream-coastal". Mitigation and adaptation efforts in the Presidential Regulation are categorised as grey, blue and green infrastructure development plans. The main focus is on the Grey plan with the construction of five canals and coastal embankments along the coastal area, the normalization of 19 main rivers, construction of drainage networks connected to 19 main rivers, coastal security and offshore connectivity. However, it is currently unclear whether the plan is based on the results and/or has integrated the results of a watershed-based flood risk assessment that considers future climate change projections.

Key Success Factors for Integrated Flood Management
The success and effectiveness of flood mitigation and adaptation efforts contained in Presidential Regulation No. 60 of 2020 are highly dependent on two things:

- The operationalisation of the Presidential Regulation at the provincial and regency/city levels, particularly through the elaboration of the Greater Jakarta urban area spatial plan into a more detailed spatial plan at the local level, province and district/city.
- The implementations of mitigation and adaptation programmes based on the results of flood risk studies that consider future climate projections.

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POLICY BRIEF 4

Dealing with Greater Jakarta Flooding Inclusively from Social, Environmental and Economic Perspectives

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Muara Angke in North Jakarta excemplifies the imbalance between the social, economic, and environmental dimensions of sustainable development.
Photo by: Martin Pattimahu, 2013.

Executive Summary

This Policy Brief provides recommendations on how to make flood mitigation and adaptation efforts socially, environmentally and economically inclusive by building synergies between the SDGs (Sustainable Development Goals), DRR (Disaster Risk Reduction) and CCA (Climate Change Adaptation).

The integration of the three international policies remains a challenge for Indonesia. Opportunities for such an integration are identified in existing development policies and spatial plans of Greater Jakarta. The Policy Brief suggests a way forward along with recommendations to: explicitly include SDGs-DRR-CCA integration in policies and programmes; start locally and assess impacts; transit to a transboundary flood governance; shape conditions for stakeholder collaboration; and build capacity.

Introduction

Greater Jakarta is an example of where economic opportunity draws people and businesses to utilise and inhabit even the smallest and most flood-prone localities, as illustrated in Box 4.1. Close to 50 percent of its inhabitants live in flood-prone areas [1]. In addition to land subsidence and climate change being the key flood inducing factors, flood risks are partly caused by development activities aimed at economic growth [2]. This leads to uncontrolled urbanisation. Floods may indeed be the result of economic development rather than caused by extrinsic calamities. At the same time, floods themselves can compromise efforts toward improving people's lives, boosting the economy or caring for the environment.

If development in Jakarta were sustainable —guided by the concept of sustainable development— the environment would be less exposed to development pressure and subsequent impacts, such as flooding. Effective disaster risk reduction (DRR) can decrease the potential impacts of flooding on development. In other words, DRR can help in making development more sustainable. Nonetheless, it is not only the environment that loses out to economic development. Social and equity goals of development have recurrently been side-lined for the sake of economic growth, as detailed in Box 4.2.

Key Messages and Recommendations

- Interventions that address Greater Jakarta's flooding problem inclusively from social, environmental and economic perspectives are grounded on an integration of the Sustainable Development Goals (SDGs), disaster risk reduction (DRR) and climate change adaptation (CCA). Indonesia is committed to implementing these international policy fields yet their integration into action remains a challenge.

- This Policy Brief provides recommendations on inclusive flood mitigation and adaptation based on an assessment of SDGs-DRR-CCA integration in existing development policies and spatial plans. The assessment seeks windows of opportunities for achieving maximum integration and impact of the above-mentioned three policy areas.

- The assessment includes DKI Jakarta Regional Mid-term Development Plan 2017-2022, DKI Jakarta Regional Spatial Plan 2030, and Presidential Regulation No. 60 of 2020 concerning the JABODETABEK-PUNJUR Urban Area Spatial Plan.

- The Policy Brief suggests a way forward along with recommendations on the below themes:

  1. Include explicitly SDGs-DRR-CCA integration in flood policies and programmes;
  2. Begin SDGs-DRR-CCA integration locally and assess impacts;
  3. Enhance adaptive capacity to reduce vulnerability;
  4. Transition to transboundary flood governance;
  5. Shape conditions for stakeholder collaboration; and
  6. Capacity building.

Box 4.1. The property business in flood-prone Kelapa Gading is driven by economic opportunities to the detriment of the environment.

The geographically low situated Kelapa Gading district in North Jakarta is a popular residential area among the middle and upper class because of its comfortable living with facilities such as schools, hospitals, and shopping malls. Since the first real estate development project in 1976, property business development has continued unabated despite the increasing flood risk in the area. Floods have struck in most annual rainy seasons. The area had to deal with multiple flood hazards during the January 2020 flooding.

Observers often attribute the increasing flood risk in the area to limited green open spaces (ruang terbuka hijau). Loss of green space has been due to the upsurge of massive building constructions [3], even at locations officially designated for water retention. Economic goals tend to take precedence over environmental ones.

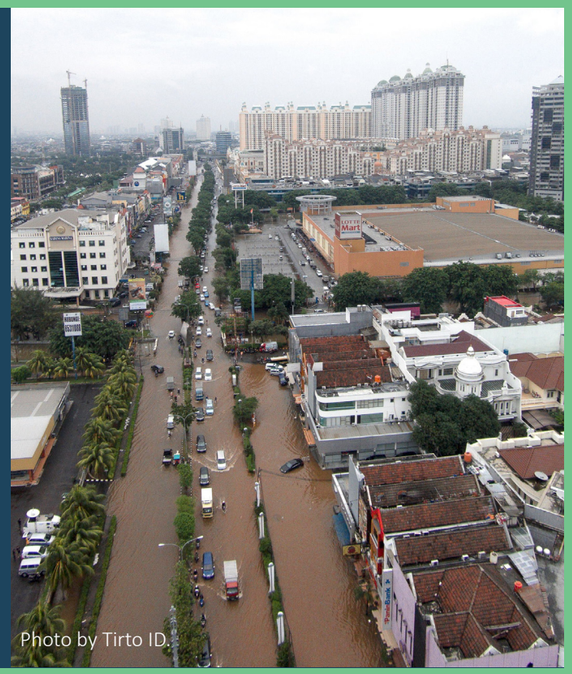

Photo by Tirto ID.

Box 4.2. Jakarta's ambitions for economic growth are often at odds with social and equity goals

Flooding in Greater Jakarta is increasingly a source of economic loss and social disruption. This is more so for vulnerable, predominantly poor communities who live on estuaries, riverbanks and other flood-prone locations. The socio-economic impact experienced by these communities, such as the loss of social networks and sources of livelihood or relocation to less flood-prone areas, are generally little understood by public services, by those not affected by floods and by those able to secure themselves and their assets from floods.

Jakarta's ambitions for economic growth and in becoming a modern metropolis potentially increase flood risk and hence also risk the livelihoods of its most vulnerable residents. Economic goals are clearly at odds with social and equity goals.

Problem Statement and Challenges

Indonesia is committed to implementing the Sustainable Development Goals (SDGs), Sendai Framework for Disaster Risk Reduction (SFDRR), and Climate Change Adaptation (CCA), but concerns have remained on how to integrate the three fields into real action.

The course of development taken by the government crucially determines whether flood risks will either increase or decrease. It would of course be ironic if, for the sake of development, Jakarta's inhabitants would become more exposed to flooding. As noted above, economic growth in the megacity has tended to side-line the social and environmental aspects of development. The United Nations Sustainable Development Goals (SDGs) offers a framework for balancing the three dimensions of sustainable development by integrating the economic, social and environmental development goals. While the SDGs' overarching aim is poverty reduction, they also provide strong guidance in making development more inclusive socially, economically and environmentally.

In addition to their integrative merits, the SDGs are also highly relevant for addressing Greater Jakarta's long-standing flooding problem. The impacts of flood hazards on society and the economy should not be overlooked and much can be gained by aiming at the SDGs through a DRR lens. The metropolis will not achieve sustainable development unless flood risks are effectively reduced.

No fewer than ten of the 17 UN SDGs explicitly include elements of DRR, namely in connection to poverty reduction (SDG 1), ending hunger (SDG 2), healthy lives (SDG 3), education (SDG 4), sustainable water management (SDG 6), building resilient infrastructure (SDG 9), resilient cities (SDG 11), climate change (SDG 13) and marine and terrestrial ecosystems (SDG 14 and SDG 15, respectively). DRR plays a prominent role in sustainable development. Building synergy between SDGs and DRR should therefore be among the key objectives of any flood mitigation and adaptation efforts.

Another UN policy, namely the Sendai Framework for Disaster Risk Reduction (SFDRR), enables DRR to reach out to the SDGs. SFDRR guides decision-makers and implementers in shaping the conditions for poverty reduction and sustainable development, which in turn can reduce flood risk. The framework underlines four priorities for action and suggests an array of stakeholders in DRR implementation, as shown in Table 4.1. Moreover, it triggers governments, donors and other stakeholders to increase their political commitment and invest in DRR.

Table 4.1. Sendai Framework for Disaster Risk Reduction (Source: UNISDR 2015 [4])

Priorities for Action			
Priority 1: Understanding disaster risk	**Priority 2:** Strengthening disaster risk governance to manage disaster risk	**Priority 3:** Investing in disaster risk reduction for resilience	**Priority 4:** Enhancing disaster preparedness for effective response and to 'Build-Back-Better' (BBB) in recovery, rehabilitation and reconstruction
Stakeholders for Implementation			
Civil society groups and networks, community-based organisations, voluntary organisation, volunteers	Academia, scientific and research entities and networks	Businesses, professional associations, private sector, financial institutions, philanthropic organisations	Media

Jakarta has been experiencing an increasing flood risk which can be attributed to climate change (see Policy Brief 1). This trend is projected to continue. However, climate change may not only affect flood risk but could also be a barrier to sustainable development. Adaptation to climate change has therefore become central in DRR and in achieving the SDGs. The enormous loss and damage that could result from climate-driven floods mean that all efforts should be put into flood risk interventions, including climate change adaptation (CCA) and other DRR options. Article 7 of the Paris Agreement on Climate Change focuses on CCA while referring to the Cancun Adaptation Framework.

Against the above backdrop, to effectively deal with the flooding problem in Greater Jakarta, implementation of the SDGs, DRR, and CCA should go hand in hand. If applied in an integrative way, the three global policies can reduce vulnerability and enhance resilience (UNFCCC 2017; see Figure 4.1.). Indonesia is committed to implementing the three international policies, but concerns have remained on how to integrate the three fields into real action [5].

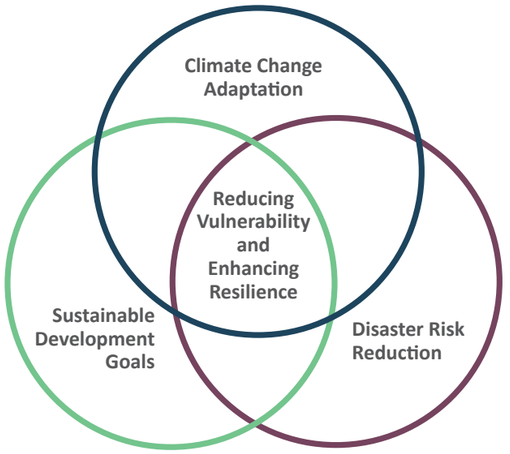

Fig. 4.1. Integration of SDGs, DRR, and CCA reduces vulnerability and enhances resilience (redrawn from UN Climate Change Secretariat, 2017 [6]).

Objective

The objective of this Policy Brief is to provide recommendations on how to make flood mitigation and adaptation efforts socially, environmentally and economically inclusive by building synergies between the SDGs, DRR, and CCA.

Windows of Opportunities for SDGs-DRR-CCA Synergy

Despite acknowledgement by the government of the need to integrate SDGs, DRR, and CCA [5], working across sectors and the three global policies has remained a challenge and require policy cohesion. This Policy Brief identifies three opportunities to achieve maximum integration and impact of these three policy fields. These opportunities relate specifically to the development and spatial plans of DKI Jakarta Province and the JABODETABEK-PUNJUR region.

DKI Jakarta Regional Medium-term Development Pan 2017-2022

In the current five-year development plan of DKI Jakarta, the SDGs are among the key factors in identifying its Strategic issues (Figure 4.1.). Moreover, three of the 18 Strategic issues can potentially impact a local community's flood resilience, namely:

- Strategic issue 3: Enhancement of equal access to public services for the disabled;
- Strategic issue 4: Women's advancement; and
- Strategic issue 8: Reduction of economic inequity.

It should be noted that Strategic issue 9 —Anticipation of fluvial, coastal and surface flooding— does not refer to climate change or sea-level rise as possible contributing factors to flooding. Yet it does recognise the need to enhance institutions and governance in flood risk management.

Box 4.3. Strategic issue 9 of DKI Jakarta's Development Plan 2017-2022 (Anticipation of fluvial, coastal and surface flooding) sees the need to enhance institutions and governance in flood risk management*

Flood risk management in Jakarta also needs to consider the importance of institutional strengthening, capacity building, and governance. This approach will enhance the effectiveness of various strategies for revitalising the river system, canals, sluice gates, detention ponds, lakes, seawater protection, early warning system and community preparedness.

*Authors' translation

Nonetheless, the Development Plan does not mention any possible links between SDGs, DRR, and CCA. If Strategic issues 3, 4, 8 and 9 are handled in an integrative way, such synergy could be achieved (see Fig. 4.1). Integrating these four issues creates an opportunity to implement inclusive flood mitigation and adaptation policies.

DKI Jakarta Regional Spatial Plan 2030

One of the ten spatial planning policies in the DKI Jakarta Regional Spatial Plan (RTRW) to be applied until 2030, stipulates that climate change mitigation and adaptation play a prominent role in DRR (Box 4.4.). However, the regulation does not explain how to realise this and build DRR-CCA synergy. There is room to develop and apply DRR-CCA measures under this particular policy.

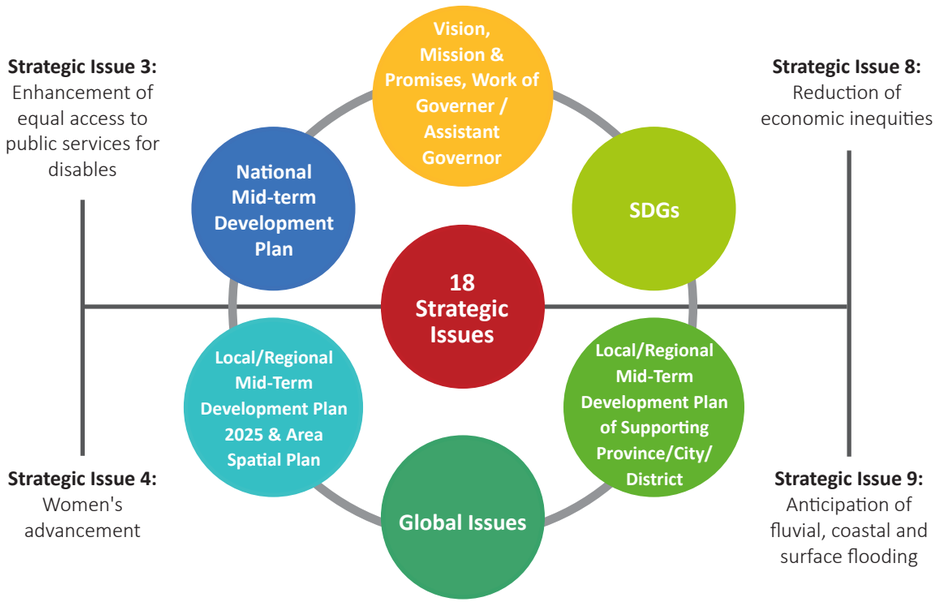

Fig. 4.2. Blending Strategic issues 3, 4, 8 and 9 of the 18 issues in Jakarta's Regional Mid-term Development Plan 2017-2022 offers potentials for SDGs-DRR-CCA synergy (Adapted from original illustration [7]).

Box 4.4. DKI Jakarta Regional Spatial Plan 2030, Second Section of Chapter IV concerning Spatial Planning Policy: Article 6, Clause 8*

To achieve disaster risk reduction targets as referred to in Article 6 letter H, the following policies are pursued:

1. Development of infrastructure and facilities for reducing the risk of natural disasters
2. Development of infrastructure and facilities for reducing the risk of non-natural disasters
3. Enhancement of adaptation and mitigation to the impact of global warming and climate change, and an increasing risk of other disasters.

* Authors' translation

JABODETABEK-PUNJUR Urban Area Spatial Plan (2020)

The recently issued Presidential Regulation regarding the JABODETABEK-PUNJUR Urban Area Spatial Plan aims to transform the region into an economic stronghold focused on industrial development, trade and service delivery. The area is governed at a regional level. DKI Jakarta is designated as an economic and financial centre surrounded by municipalities and regencies that function as, for example, housing or industrial territories. Nonetheless, the Spatial Plan's goal and associated policies as formulated in the Regulation do not clearly specify what the environmental objectives are. Moreover, social objectives and policies are completely absent. This flaw could compromise sustainable development.

At the policy and strategy level, sustainable development is only referred to in connection with the need for water retention and protected areas, in aiming at water and soil sources conservation and flood control. Less clear is how spatial planning policies and strategies could contribute to sustainable development. In addition to this, the regulation does not refer to climate change adaptation and disaster risk reduction as necessary components of spatial planning, nor how they might be interrelated. This Policy Brief identifies an opportunity for SDGs-DRR-CCA integration, as shown in Box 4.5.

Box 4.5. Windows of opportunity towards SDGs-DRR-CCA integration in JABODETABEK-PUNJUR

Conforming to the Spatial Plan Regulation, spatial planning governance is the responsibility of multiple line-ministries and sectoral agencies at various government levels. Coordination is specifically assigned to a public agency. This provides room for an integrated eco-regional flood governance that crosses boundaries of different jurisdictions, sectors and institutions. In addition to this, the Regulation underscores the need to improve natural elements in the ecosystem, such as ponds (situ), lakes (danau) or detention ponds (embung), creating space for the development of flood measures that are environmentally inclusive.

Photo by Kemensos.go.id.

Results and Recommendations

Include explicitly SDGs-DRR-CCA integration in flood policies and programmes

The government must make explicit the need for SDGs-DRR-CCA integration in flood policies and programmes. While this could happen across all scales in the region, it is recommended that the DKI Jakarta Government takes the lead in this, given its administrative and geographical position and access to more resources. DKI Jakarta can be at the forefront and be a role model in promoting social, economic and environmental inclusiveness in flood interventions. Existing policies and programmes do not necessarily need be replaced and various approaches are possible, as shown by the following recommendations:

Recommendation 1
Make explicit SDGs, DRR and CCA interconnections in future DKI Jakarta mid-term and long-term development plans (DKI Jakarta RPJMD and RPJPD), spatial plans (DKI Jakarta RTRW) and revisions of current plans. This effort is central but can only be realised when operational instruments are available. Mid-term development plans play a key guiding role for relevant sectors to build their internal capacity while aiming at achieving the targets.

1. Choose a course of development focused on disaster and climate resilience with interventions that complement and link SDGs, DRR and CCA policies and programmes.
2. Adopt planned adaptation in planning structures to more strongly bolster DRR-CCA links (planned adaptation is discussed in the below section on adaptive capacity).

Begin SDGs-DRR-CCA integration locally and assess impacts

As floods occur at the local level, actual SDGs-DRR-CCA integration in response to the floods can best begin locally. Such integration can offer solace in advancing flood programmes to account for vulnerabilities. Linking the SDGs, DRR, and CCA is most effective and efficient if initiatives complement existing programmes that are being pursued by municipalities and local public services. Service delivery structures and impact assessment frameworks need to be adapted accordingly. For initiatives to work well, frontline services should recognise that different social vulnerabilities may apply, as shown in Box 4.6.

Box 4.6. Social vulnerabilities and different meanings attributed to flood risk in a community or society

Flood risk is a function of hazard, exposure and vulnerability [10], as discussed in Policy Brief 1. Within a community or society, different groups may be similarly exposed to a flood hazard. However, because in responding to the flood hazard they have distinct roles, capabilities and opportunities in the community, they differently experience the impacts from the flood. This explains why different groups within the community or society —i.e. women, men, children, adults, the elderly, the disabled, productive group etc.—may ascribe different meanings to flood risk.

Recommendation 2

With reference to DKI Jakarta Regional Mid-term Development Plan 2017-2022:

1. Insert flood risk reduction and climate adaptation in existing municipality programmes and local public services such as water, health, sanitation, waste disposal and education, while linking interventions to sustainable development priorities.
2. Integrate SDGs, DRR and CCA by combining the four Strategic issues of the DKI Jakarta 2017-2022 Development Plan, but not exclusively these:
   Strategic Issue 3: Enhancement of access to public services for the disabled in a community/ society.
   Strategic Issue 4: Women's advancement.
   Strategic Issue 8: Reduction of economic inequity.
   Strategic Issue 9: Anticipation of fluvial, coastal and surface flooding'.
   Include in Strategic issue 4: 'Women's advancement', flood risk preparedness and building-back-better (BBB) activities and engage women in decision-making
   Annex C provides tips for gender-sensitive flood preparedness and BBB.
3. Adapt accordingly public delivery structures and develop impact assessment frameworks to mainstream SDGs, DRR and CCA at programmatic and project levels.

Enhance adaptive capacity to reduce vulnerability

The vulnerability of a system (community or region) can be reduced by enhancing its adaptive capacity. A strong approach for the enhancement of adaptive capacity is planned adaptation (adaptasi terencana), which refers to the human action that is consciously undertaken in response to or in anticipation of changed conditions [13]. This approach can be adopted in existing programmes and comprises the following iterative steps: information awareness (for goal-setting), planning design, implementation, monitoring and evaluation, and adaptation, as illustrated in Figure 4.3. The four components highlighted by the grey area depict human action, while 'Climate change', 'Climate variability' and, 'Other stresses' (such as floods or economic crises) all result in 'Impacts' that require human action.'

Planned adaptation can be adopted in existing development programmes of DKI Jakarta and new initiatives will not always be necessary. The planned adaptation process helps to more strongly connect DRR with CCA due to the conscious focus on risk reduction and climate change which benefits sustainable development. The process uses so-called adaptation tools including methods and approaches in flood risk assessment, socioeconomic evaluation, and integrating spatial planning and water management which can assist in decision-making [14]. These are discussed in Policy Brief 1 and Policy Brief 5.

Building adaptive capacity can be accelerated if the 'Planning design' (Figure 4.3.) is aimed at creating conditions for adaptive capacity to develop. In order to do so, it is crucial to be aware of the following key determinants: economic resources, information and skills, technology, social infrastructure and equity [15]. These are detailed in Annex A.

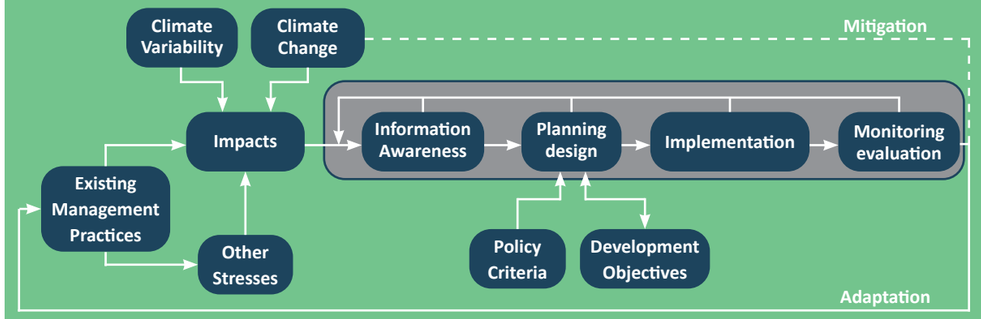

Fig. 4.3. Iterative steps in planned adaptation to climate change

Recommendation 3

With reference to DKI Jakarta Regional Mid-term Development Plan 2017-2022:

- Enhance the adaptive capacity of a community or region with the adoption of the planned adaptation in existing development programmes in compliance with the current DKI Jakarta five-year development plan, its revisions and subsequent development plans.
- Develop the planning design component in planned adaptation for bolstering adaptive capacity.

Transition to transboundary flood governance

The government participants should be a representative mixture of age, position and rank. In addition to this, the participants should be selected from different sectors of local government departments as most decisions are made by higher-ranking government officials while the implementations are made by lower-ranking government officials. In this way, knowledge will be disseminated across sectors and hierarchies.

Nature-based solutions (NBS) provide a solid basis for boundary-spanning ecoregional flood governance. They offer a relatively new strategy to urban development by viewing humans as part of nature and that the wise use of ecosystem services is key for sustainable development. There is increasing recognition of the role of ecosystems in flood risk reduction and climate adaptation [17], also discussed in Policy Brief 5. A healthy ecosystem reduces the likelihood and intensity of destructive floods and functions as natural infrastructure. Spatial planning that embraces NBS is based on an understanding of the hydrological dynamics of the ecosystem and how upstream-downstream development activities affect them and may lead to flooding. Policy Brief 2 has more details on NBS. Annex B presents the principles of NBS [18].

NBS require well-coordinated governance that is anchored in decision-making based on river basin management (Policy Brief 3 and Policy Brief 5). Yet NBS projects tend to be too fragmented and of too little scale to have a meaningful impact. Existing decision-making and implementation barriers have to be broken down to make cross-sectoral and multi-level coordination and collaboration possible. Policy Brief 5 discusses this challenge.

Application of NBS in urban development is also challenged when objectives not relating to nature prevail, such as economic growth, or if ecological knowledge among decision-makers, planners and urban developers is insufficient. Policy Brief 2 uses the term soft measures for NBS and provides examples.

In Greater Jakarta, NBS can be applied when carrying out a Strategic Environmental Assessment (SEA or Kajian Lingkungan Hidup Strategis--KLHS). SEA is an obligatory component in development plans and spatial plans. SEA has the purpose to ensure that plans are grounded on sustainable development and include vulnerability assessments as well as assessments of the prevailing level of climate adaptation (5). SEA promotes coherence between SDGs, DRR and CCA. Experts carry out SEA while using the best available (scientific) knowledge and engaging local communities and other stakeholders in the process.

This Policy Brief recommends that DKI Jakarta leads the process of transition towards ecoregional flood governance given its administrative, geographical and financial position in the JABODETABEK-PUNJUR region to subsequently reach out to surrounding municipalities, cities and regencies.
A pathway of the transition process is recommended as follows:

Recommendation 4:
With reference to DKI Jakarta Regional Mid-term Development Plan 2017-2022, DKI Jakarta Regional Spatial Plan 2030 and Presidential Regulation No. 60 of 2020 regarding the JABODETABEK-PUNJUR Urban Area Spatial Plan:

- Develop collaborative, anticipatory ecoregional flood governance anchored in decision-making based on river basin management and nature-based solutions using the newest available multi-disciplinary (scientific) knowledge (see Policy Brief 5).
- Assign the Coordinating Institute as stipulated in the Presidential Regulation in the design, planning, implementation, monitoring and institutional set-up of above-mentioned cross-boundary ecoregional flood governance, advised and assisted as necessary by multidisciplinary experts. DKI Jakarta should lead the transition process until the Coordinating Institute is operational.
- Make explicit in the JABODETABEK-PUNJUR development plans and spatial plans, as well as in their technical documents, the role of ecosystems and nature-based solutions in reducing flood and climate risk and climate change adaptation.
- `Develop the JABODETABEK-PUNJUR Regional Strategic Environmental Analysis (RSEA; Kajian Lingkungan Hidup Strategis Regional) based on the newest available scientific data and well-tested verified methods, which should be used as the basis for subsequent development and spatial planning processes in DKI Jakarta and the region, including revision cycles. The RSEA document should be used in the entire process of drafting, implementation and monitoring of regional and sub-regional spatial planning and development planning. It should contain both general and specific recommendations, including to the areas of flood mitigation and adaptation, drafted by a multidisciplinary team of experts.

Shape conditions for stakeholder collaboration

Recommendation 5:
Adopt Adaptive Collaborative Management (ACM) approach to ecoregional flood governance referred to in Recommendation 3a) and 3b) to span boundaries of different jurisdictions, sectors and institutions. This recommendation is further detailed in Policy Brief 5.

Capacity building

Recommendation 6 includes the following aspects:
Build technical, communication and collaborative capacity of public officials and public service staff in the following areas:

- Science-based integrated programming and implementation related to SDGs, DRR and CCA
- Planned adaptation and use of climate adaptation tools
- Nature-based solutions
- Communication and collaboration with local experts and professionals and business in these areas.
- It is noted that achieving the SDGs requires substantive additional capacities in the water sector, as well as a change in mindsets [19]. It is also recommended to combine technical training with training in so-called meta-skills e.g., design capacities, as well as develop behavioural skills that support implementation by way of on-the-job training. Policy Brief 6 also pinpoints these capacity-building needs.

Concluding Remarks

The factors underlying the flooding problem of Greater Jakarta are numerous, complex and interdependent. They comprise multiple crises of a social, economic and environmental nature that have more recently been jeopardised by climate change. Moreover, weak governance and law enforcement crucially hinder the effective handling of flooding. The relocating of the capital to East Kalimantan, by 2024, may avert economic activities and ease the environmental pressures. However, it will remain a challenge to protect Greater Jakarta from future flooding. This Policy Brief offers a pragmatic approach by identifying opportunities in existing development plans and spatial plans of Greater Jakarta for integrating the SDGs, DRR, and CCA policy fields. In this way, co-benefits of the three distinct policies can be delivered and conditions are created for an inclusive transboundary flood governance across sectors, institutions, levels and scales.

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Annexes

Annex A: Determinants of adaptive capacity of a system (adapted from [15])

Economic resources	The wealthier a community or region is, the better it is prepared to bear the costs of adaptation to flood risks, it can cope with disasters and manage vulnerability.
Information and skills	Information and skills enable a community or region to recognise the need to adapt; develop knowledge on adaptation options; enhance the ability to decide which options to take and to implement it.
Technology	Most adaptive strategies for dealing with flood risks involve technology in some way. The access to technology and the ability to adopt it, is crucial for the adaptive capacity of a society or community.
Social infrastructure	The availability of and access to resources held by vulnerable groups and by decision-makers in the system partly determine the system's capacity to adapt.
Equity	The adaptive capacity of a community or region is likely to be greater if the access to resources, information and technology is more equally distributed in its residents differentiated along demographic variables, such as age, gender, ethnicity, level of education, and health.
Institutions	Effective institutional arrangements (not necessarily public ones) are a means to raise awareness about and give sense of purpose to adapt. They facilitate the management of present flood risks and provide the institutional basis for dealing with climate uncertainties and related flooding, for anticipating future flood risks and to accordingly adapt. Moreover, such institutions govern the equitable and transparent distribution of decision-making power, resources, information and technology within the system.

Annex B: IUCN principles of nature-based solutions [18]

Embrace norms and principles of nature conservation.

Are determined by site-specific natural and cultural contexts that include traditional, local and scientific knowledge.

Can be implemented alone or in an integrated manner with other solutions to societal challenges (e.g. technological and engineering solutions).

Are an integral part of the overall design of policies, and measures or actions, to address specific challenges.

Are applied at a landscape scale.

Maintain biological and cultural diversity and the ability of ecosystems to evolve over time.

Recognise and address the trade-offs between the production of a few immediate economic benefits for development, and future options to produce the full range of ecosystems services.

Annex C: Tips for gender-sensitive flood preparedness and building-back-better in DRR

Issue	Check-list for base-line (situation at a given point of time)	Building-back-better (partly output, partly outcome indicators)
Deaths	a. More women and children than men may die when sudden disasters happen. Are sex- and age-segregated data available on deaths due to flooding in Jakarta? b. COVID-19 is more lethal in flood prone areas, because these are often densely populated slum areas? Are there any gender- and age-segregated data on deaths due to COVID-19 for these areas?	Outcome should include the reduction of loss of life (only measurable after completion of a building project).
Livelihoods and personal assets	a. Income earning activities often differ for men and for women. Women are more often engaged in income generating activities at home than men (informal sector), so their livelihoods tend to be more impacted / endangered by flooding. Loss of equipment, materials stacked at home. b. COVID-19 affects livelihoods, causing not only loss of jobs but also access of producers to market their product. Think of street food producers and *warung* (petty trade shop) holders, of whom the majority are female. How are they affected when they use *Gojek* (motorbike taxi)?	When an FGD is held on livelihoods, ensure that both men and women participate so they become (more) aware of the needs of each other. This will ensure that women's needs are not overlooked due to priorities voiced by men (NB: this may be situation specific and dependent on the socio-culture).
Health	a. Women are 'in charge' of taking care not only of their own health but of their family members too. Access to flood free health care is hence not only important for women, but also for their children and families. b. Covid-19 infects people not needing hospitalisation; but personal isolation is nearly impossible in slum areas, in particular during flooding. Displaced people because of flooding are often brought to schools. This does however not allow easy access to health services.	a. Outcomes should include security of livelihoods (measurable in the long run). Ensure that *Puskesmas* (health centres) are flood free. Build two story buildings: ground floor for example for parking. Ensure access is easy for the elderly and disabled (hand-operated elevator and/or ramp). Health centres are best positioned close to markets for easy access (see below). b. Health centres need extra space for taking in sick people. Such space needs to be part of building plans. It should preferably be situated next to the market for easy access by women.
Clean water	a. Women at household level are the main users of water. For example, cooking. Is there data whether women buy water for this or use (communal) tap water? b. Clean water for bathing is also important to prevent skin disease (all can be affected, but particularly children).	Building back better means households need access to clean water. Access should be secured during flooding.

Issue	Check-list for base-line (situation at a given point of time)	Building-back-better (partly output, partly outcome indicators)
Sanitation	a. Open gutters in most slum areas are a source of disease (diarrhoea etc.) and overflow when a flood occurs. b. Toilets: do people have septic tanks? Where is the human waste deposited: in the gutter?	A system of drainage has to be built in such a way that it functions well during flooding.
Markets	a. Women often purchase household items at markets. Markets are often crowded places with narrow alleys and thus often *becek* (muddy). b. It is clear that COVID-19 spreads easily though markets? Not only women buyers but also market traders are vulnerable because they come in close contact with many people.	a. Ensure that markets are flood free (elevated space). Build multi-story markets (food downstairs for easy access for suppliers and buyers). b. Ensure that markets are rebuilt with sufficient space between rows of stalls to facilitate social distancing.
Garbage disposal	At household level, women are the main producers of household waste (including diapers, menstrual pads). It clogs the gutters and rivers, contributing to the flooding itself. People are often unable/unwilling to pay for *pemulung* (garbage collectors).	A special facility needs to be built for garbage disposal, allowing for separation of reusable waste for compost, plastic for recycling, etc. Women need to be trained / empowered to separate garbage. It would be even better if they can obtain income from waste management, e.g. *bank sampah* (waste bank).
Stakeholders & inclusiveness	Relevant stakeholders for inclusion of women in planning and implementation: 1. The majority of women in slum and flood-prone areas are Muslim. They often take part in Koran reading meetings (*pengajian*). 2. PKK, the local women's organisation (if active in the neighbourhood). 3. Engage NGOs who work with women in these areas. 4. The local *bank sampah* (waste bank), if available.	
Gendered approach	Often activities organised for women in accordance with the prevalent gender division of labour are attended by women only.	

POLICY BRIEF 5

Multi-Stakeholder Platform for Integrating Flood Risk Management with Spatial Planning in Greater Jakarta

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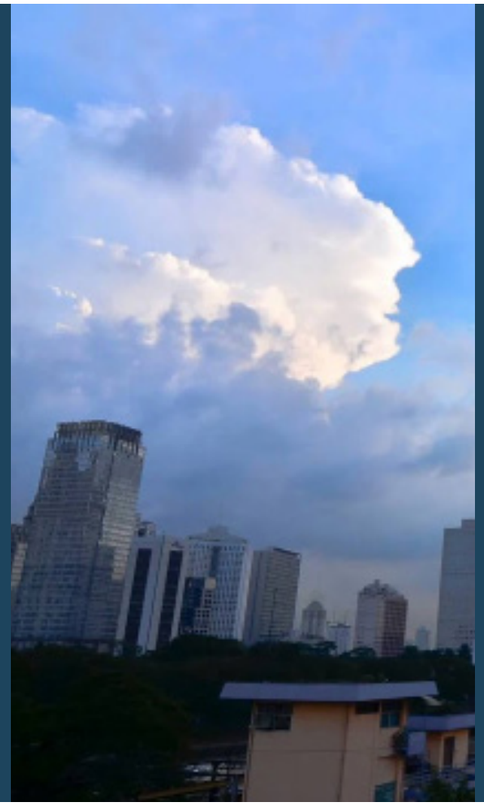

Executive Summary

Successful integration of flood risk management (FRM) with spatial planning serves as a tool to increase the ability of an area to anticipate the impacts of climate change and improve its adaptive capacity. Effective collaboration between stakeholders is thereby crucial. In Indonesia, a lack of collaboration has long been a serious issue. This Policy Brief notes that the main barriers for stakeholder collaboration include fragmented institutions and stakeholders, imbalances of power and interests, ineffective mechanism for shared decision-making and a lack of dispute management instruments. This Policy Brief provides recommendations for the effective functioning of the coordinating agency that is mandated by Presidential Regulation No. 60 of 2020 concerning the Greater Jakarta Urban Spatial Plan. This agency is envisioned in this Brief as a multi-stakeholder collaboration platform for the integration of FRM with spatial planning in Greater Jakarta.

Introduction

Climate change-related extreme events such as floods have been and will continue to present an immense challenge to Indonesia and particularly Greater Jakarta (Policy Brief 1). A large body of research has increasingly shown the importance of integrating FRM with spatial planning to enhance flood resilience [1,2]. However, its operationalisation remains challenging.

Successful integration of FRM with spatial planning serves as a tool to increase the ability of an area to anticipate the impacts of climate change and improve its adaptive capacity (Policy Brief 4). The integration can reduce flood risk by, for instance, designating suitable land-use types, arranging activities across spatial scales while deploying different yet complementary hard, soft and green measures (see Policy Brief 2) and shaping the built environment. In addition to this, the spatial development agenda and other sectoral agendas can be developed into comprehensive and cohesive programmes supported by funding and procedures. Effective collaboration between stakeholders is therefore imperative. Nonetheless, the collaborative work required for the integration of FRM with spatial planning is challenging, both conceptually and in practice.

Despite the challenges, attempts have been made by the Indonesian Government at various levels to enhance stakeholder collaboration when integrating FRM with spatial planning. Among these attempts is the enactment of Presidential Regulation (Peraturan Presiden/Perpres) No. 60 of 2020 (see Box 5.1). This regulation provides a mandate for developing an integrated spatial plan for Greater Jakarta which incorporates FRM as well as the establishment of an agency to coordinate the implementation of spatial planning and stakeholder collaboration between the various regions, institutions, and sectors (Policy Briefs 3 and 4). However, the challenges faced in realising this are institutional fragmentation, inflexible legal systems and socio-economic and political dynamics.

Key Messages and Recommendations

The integration of flood risk management with spatial planning is important. However, its operationalisation remains challenging. Such integration requires active involvement and close collaboration between stakeholders within the public and private sectors, community groups and the academic world. This lack of collaboration has long been a serious issue in Indonesia.

Institutional barriers for collaboration include fragmented institutions and stakeholders, imbalances of power and interests, an ineffective mechanism for shared decision-making (including those related to funding and programming) and a lack of dispute management instruments for stakeholder conflicts.

This Policy Brief provides recommendations for the effective functioning of the coordinating agency in the implementation of Presidential Regulation No. 60 of 2020 concerning the Greater Jakarta Urban Spatial Plan.

The following five recommendations should be implemented to ensure flood risk management integration with spatial planning:

1. Apply an ecoregional-based approach
2. Identify and engage all stakeholders
3. Implement a science-policy-practice interface
4. Synchronise stakeholder roles and responsibilities
5. Implement a stakeholder conflict resolution process.

Box 5.1:
Article 135, Paragraph (1) Presidential Regulation No. 60 of 2020 concerning the Greater Jakarta Urban Area Spatial Plan*

"In order to coordinate the implementation of the JABODETABEK-PUNJUR Urban Area as referred to Article 134 Paragraph (2), a coordinating institution for the management of the Jabodetabek-Punjur Urban Area spatial planning will be established, in accordance with the provisions of laws and regulations."
*Authors' translation.

Objectives

This Policy Brief provides recommendations for the effective functioning of the above-mentioned coordinating agency in the implementation of the Greater Jakarta Urban Spatial Plan. This agency is thereby envisioned as a multi-stakeholder collaboration platform for the integration of FRM with spatial planning in this region. Furthermore, this brief is a call to action for building inclusive and effective stakeholder collaboration for realising this integration. This can effectively address the challenges of sustainable development, including those concerning climate change-induced flooding.

Framing Stakeholder Collaboration for Greater Jakarta Flooding

The framing of stakeholder collaboration in the context of FRM should put central target 6.3 of the Sustainable Development Goal (SDG) 6. It specifies that water management should "…by 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate." SDG 17 should also be considered as a guiding principle for enhancing stakeholder collaboration and partnership to mobilise and share knowledge, expertise, technology and financial resources which are essential in the implementation of the integrated FRM (IFRM) concept. Other SDGs are also relevant, namely those that are associated with: building resilient infrastructure (Goal 9), resilient cities (Goal 11), climate change (Goal 13) and marine and terrestrial ecosystems (Goals 14 and 15). This Policy Brief follows OECD's definition of stakeholder engagement in water resource management [3] while adapting it to the flooding context, shown in Box 5.2.

Initiating and maintaining effective and appropriate stakeholder collaboration in Greater Jakarta is not easy. Scholars identified a range of predominantly institutional barriers including fragmented institutions and/or stakeholders with an imbalanced distribution of power and interest, an ineffective mechanism for shared decision-making and the necessary funding and programming activities, as well as a lack of dispute management instruments [see e.g., 4,5,6].

Multi-Stakeholder Collaboration Platform

Given the barriers, a multi-stakeholder collaboration platform is necessary and needs to be carefully organised. Such a platform can be of a formal or informal nature to enable stakeholder collaboration and negotiation. This Policy Brief adopts a definition of a multi-stakeholder collaboration platform which is widely accepted [7] and is shown in Box 5.3.

Box 5.3. Definition of multi-stakeholder collaboration platform

A decision-making body (voluntary or statutory) comprising different stakeholders who perceive the same resource management problem, realise their interdependence for solving it and come together to agree on action strategies for solving the problem.

Such a platform can function as a mechanism or institution for accommodating different stakeholder perspectives. It also can be a problem-solving social or institutional innovation for democratising flood risk decision-making, managing conflicts or making FRM more efficient. Once stakeholders see the necessity to include multiple stakeholder voices, a broad acceptance follows for dealing with the increasing complexity, diversity and dynamics of IFRM.

Box 5.2. Definition of multi-stakeholder collaboration

Multi-stakeholder collaboration is the process by which persons, groups or institutions who have a stake in a water-related topic are engaged in a partnership in joint activities, decision-making and implementation and through which process multi-stakeholder learning and adaptation takes place in response to changing social, economic and environmental conditions.

Implementation Framework

Effective stakeholder collaboration commonly relies on scientific information and its uptake for decision-making, impartial facilitation and mediation, and multiple stakeholder engagement at different governance levels and scales [8]. Collaboration also has to form a bridge between public and private sectors, communities and the academic world. An effective collaboration platform should enable all stakeholders to follow processes in ways that they find satisfactory [9]. Collaboration also means sharing information and knowledge to foster increased confidence and trust in finding common ground [10]. For collaboration to work, the "integrated" attribute of IFRM should be put in a policy framework and transferred into implementation. These processes include agreeing on shared values, accommodating different beliefs, perceptions and political concerns, identifying and formulating shared problems, setting up programmes and addressing responses to collective decisions.

IFRM should also account for future uncertainties. In addition to climate change, other contributing factors that drive change concern the social dynamics between stakeholders and the spatial temporality of the geographical region, particularly as a result of economic and social activities. For IFRM, this necessitates a continuous reconsideration of underlying principles and the selection and application of the best-fit spatial planning policies, instruments and technical measures. An effective IFRM collaborative process provides a platform for different stakeholders to engage themselves in dialogue. It facilitates the development of knowledge and perspectives and creates conditions for reframing problems and hypotheses through a collaborative and adaptive process.

This Policy Brief suggests an IFRM implementation framework that consists of five components according to the adaptive collaborative management or adaptive co-management (ACM) concepts by Ansell and Gash, 2008 [11]. To better fit it in the Greater Jakarta flooding context, particular elements have been added in connection to the collaborative and adaptive aspects of IFRM, depicted in Figure 5.1.

In this Policy Brief, the basic idea of ACM is to continuously and collaboratively manage related resources based on improved stakeholder knowledge of flood risk management and spatial planning, to generate effective action. Social learning fosters collaboration whilst adapting to the complexity and uncertainty of the biophysical and social system, thereby addressing IFRM governance challenges [11, 12]. Physical interventions of IFRM need to be incorporated in spatial planning and therefore be aligned with a broad range of political and development objectives (including housing, nature, health, and economic growth). Moreover, problems and solutions need to be identified and applied at different spatial scales and have to account for long-term, adaptive strategies for addressing flooding and climate change uncertainties [13].

1. **Contextual conditions**
   The starting conditions include but are not limited to the 5 aspects shown in Figure 5.1. In Greater Jakarta, power, knowledge and financial imbalances between different levels of government have long prevailed. The closer an individual is to the "centre of power" (i.e., central government or higher-level government), the more decision-making power they have. Rather than breaking down power and institutional structures, the IFRM implementation framework discussed here, highlights the need to transform institutional structures through social and institutional learning. This approach fosters collaboration as well as the adaptation to complex biophysical and social-political circumstances.

   Social, economic, environmental/biophysical and policy conditions
   In addition to the above starting conditions, these factors represent the basic ingredients for institutional design and facilitative leadership deemed necessary for effective and fair multi-stakeholder collaboration.

2. **Institutional design**
   Institutional design refers to the rules agreed by stakeholders and considered necessary for an effective collaborative process. It also provides the foundation for an ecoregional adaptive and collaborative process. Specifically, it checks how different stakeholders in the ecoregion are engaged, in terms of levels, scales roles and responsibilities. Institutional design is also key for grounding principled stakeholder engagement, namely in connection to transparency, accountability, and fair decision-making. Lastly, institutional design lays down the basis for effective communication and collaboration between different fields of science, policy and practice, particularly for facing and anticipating uncertainties inherent in flood and climate risks.

3. **Facilitative leadership**
   A leadership role is critical for achieving goals, delivering expected outcomes, facilitating communication and learning among stakeholders, exploring mutual benefits and reaching consensus (especially when there is a high level of conflict, low trust, or unequal power distribution). Leadership is also essential in guiding multi-stakeholders to assess and anticipate various social, environmental and economic futures. The role of facilitative leadership is crucial when navigating the complex and uncertain social and biophysical circumstances surrounding stakeholders and encouraging the development of collective knowledge in support of platform decision-making.

4. **Adaptive-collaborative process**
The adaptive-collaborative process consists of the following interconnected components: trust-building, commitment to processes, shared understanding, intermediate outcomes (e.g., strategic plans and joint fact-finding) and dialogue and communication. Social learning is at the core of the adaptive-collaborative process, as depicted in Figure 5.1. [14]. IFRM interventions can employ various management approaches to stimulate learning and adaptive-collaborative processes to reveal and accommodate specific stakeholders' needs and obligations. expected co-benefits include flood risk reduction, water harvesting and saving, spatial quality improvement, social empowerment and local and regional economic development.

5. **Co-benefits as outcomes**
The expected co-benefits include flood risk reduction, water harvesting and saving, spatial quality improvement, social empowerment and local and regional economic development.

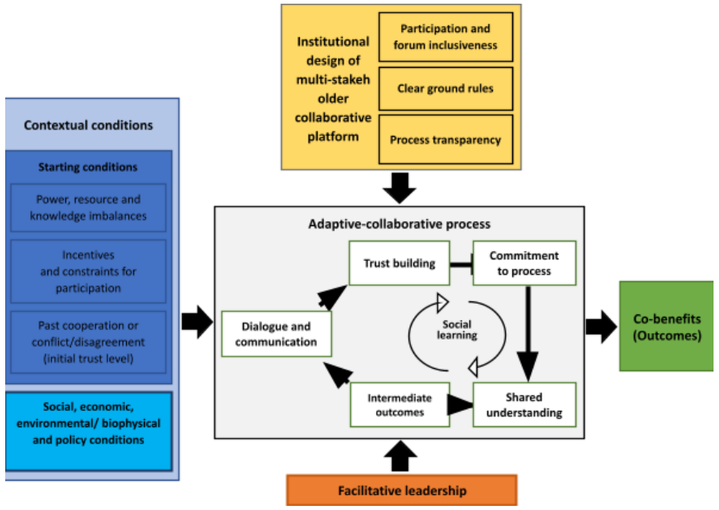

Fig. 5.1. A model of adaptive-collaborative governance of Greater Jakarta flooding (adapted from [11])

Some conceptual underpinnings are essential for effectively initiating and implementing an IFRM multi-stakeholder collaboration platform for Greater Jakarta. They provide the groundwork for the above implementation framework, as outlined further below.

Ecoregional Perspective for Integrated Flood Risk Management

It is crucial that IFRM initiatives take into account the scale of the impact human activities have on land use management and conservation activities [15,16]. Since relatively recently flood risks have been greatly influenced by climate change (Policy Brief 1). Because ecosystems play an important role in shaping and contributing to transmission processes in the micro and macro climate systems, the spatial scale employed in IFRM initiatives should correspond to the structural characteristics of the ecosystem concerned.

From this perspective, it is important that IFRM scales are delineated by the boundaries of natural ecosystems. As ecosystem boundaries often cross different administrative or political jurisdictions at different levels, collaboration among stakeholders of the various territories is warranted.

An ecoregion was originally defined as having biotic and abiotic characteristics of ecosystems in the absence of humans.

More recently, the term has taken on a more holistic meaning regarding the human and social systems as part of the biota [17]. In spatial planning, ecoregions can be considered a spatial framework for ecosystem assessment, research, inventory, monitoring and management.

Ecoregions are multi-purpose entities for various types of resource management, such as forests, fish and wildlife, wetlands, water and agriculture. They also serve to organise resource management activities toward a more holistic ecosystem approach while taking account of all aspects of the environment.

Greater Jakarta is a delta area that consists of complex biophysical and social systems. As a biophysical and social system, the delta is not aligned with the existing administrative boundaries. The delta is an integrated system, consisting of different jurisdictions from upper to downstream and stretching out into three provinces, five regencies and five satellite cities (see Glossary).

The unaligned biophysical, social, and administrative boundaries result in enormous challenges for effectively managing flooding in the area. In particular, it is challenging to determine the administrative and political jurisdictions for flood risks [18]. Who are the relevant stakeholders and institutions? What measures will ensure that all are meaningfully involved? It is also a challenge to ensure that these stakeholders and institutions coherently, synergistically and collaboratively interact to develop complementary visions, tools and joint actions.
The challenges of applying an ecoregional approach can be addressed by developing an integrated spatial plan for Greater Jakarta and setting up a specialised collaboration agency (as mandated by the President Regulation No. 20 of 2020). Identifying the trade-offs and synergies between governing stakeholders is also crucial and useful in developing incentive and reward mechanisms to stimulate collaboration [19]. For example, financial support can be offered to provincial and local governments for promoting ecoregional collaboration and payment can be offered to landowners for ecosystem services.

An ecoregional perspective of IFRM would encourage governmental and non-governmental stakeholders in Greater Jakarta to build a common understanding. Flooding in the region is a shared problem and can only be addressed with a common vision and collaborative approach.

Stakeholder Engagement

As flooding is a shared problem, solutions can only be effective when found through a process where stakeholders collaborate to create a shared understanding of the system and their positions. Stakeholders are expected to develop a shared strategic vision of territorial development towards flood and climate resilience, build commitment and implement their shared vision [20].

Meaningful engagement of all stakeholders plays a major role in achieving effective and fair collaboration [21]. Engaging a broad range of stakeholders in IFRM promises to increase the awareness of risks and costs, build social and political acceptance of decisions and reduce potential conflicts over which flood risk strategy to adopt.

The social character of the flooding problem also necessitates a flexible and adaptive approach of IFRM rather than a bureaucratic, top-down approach [22]. Following OECD, collaboration requires a certain degree of stakeholder engagement characterised by joint agreements (see Figure 5.2). Institutions and leadership play crucial roles in facilitating collaboration by taking into account any relevant starting conditions such as imbalances of power, resources and knowledge, existing incentives and past cooperation or conflict [3]. The institutional design is the

Agricultural area around Ciliwung River watershed.
Photo by Said Abdullah.

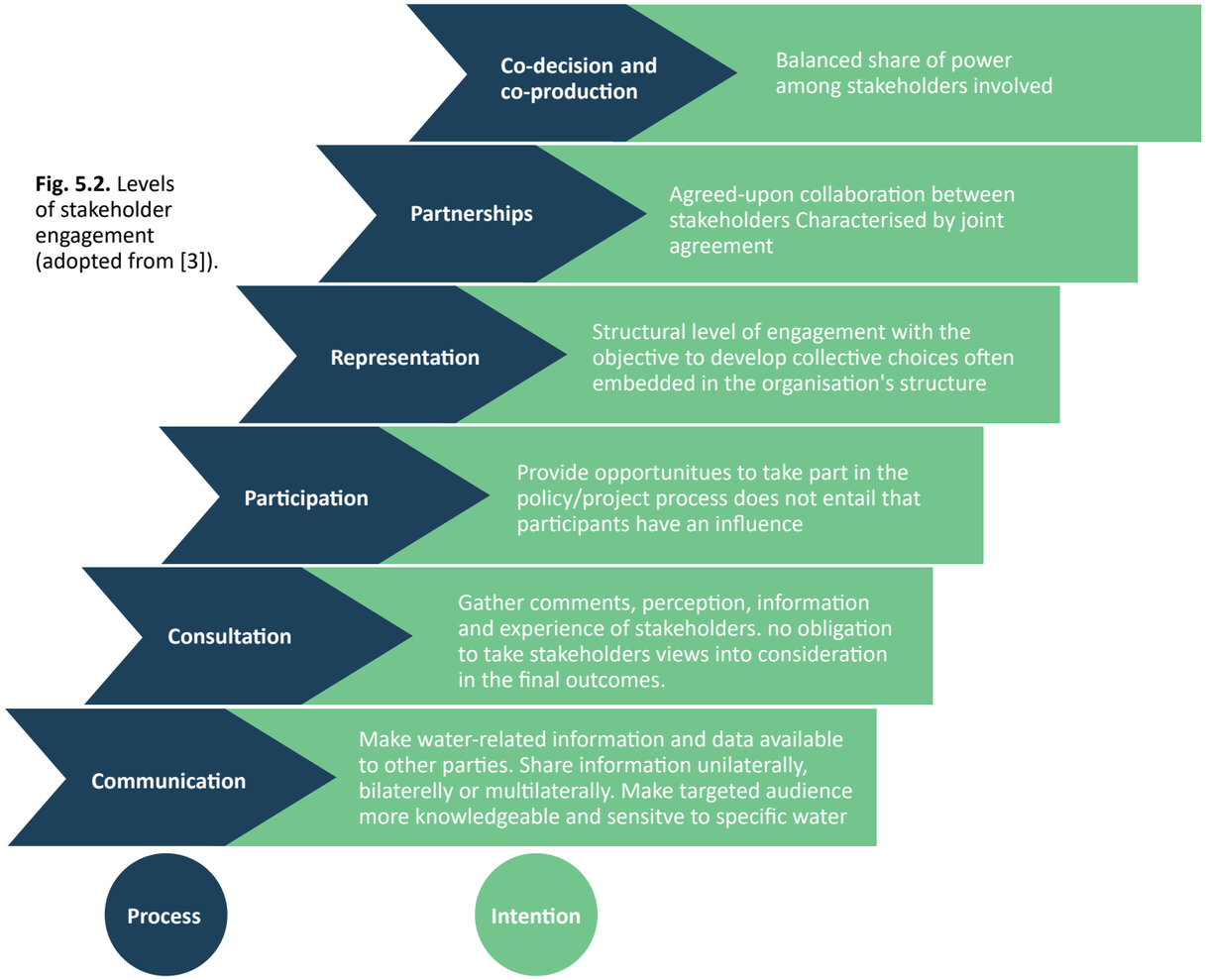

Fig. 5.2. Levels of stakeholder engagement (adopted from [3]).

foundation of a principled engagement that takes account of representation, transparency and accountability, as well as fair decision-making.

Furthermore, an IFRM collaborative approach should also empower stakeholders to adequately respond to changes in the socio-economic and biophysical environment and enable them to confront uncertainties caused by flood hazards and climate change. As it is not possible to accurately predict the magnitude of the effects caused by drivers of flood risk, IFRM approaches should perform well under various possible future scenarios [23], which may affect stakeholders differently.

Stakeholder engagement is context-dependent and is therefore not easy to replicate. However, some general conditions apply for attaining effective stakeholder engagement. Of these, inclusiveness is the most important. Stakeholders holding a stake in the outcomes of collaboration, or who are likely to be affected by it, should be mapped out in terms of responsibility, motivations, and interactions. Various stakeholders should also be analysed according to differentials such as gender, ethnicity, socio-economic and socio-cultural status, location, educational level, and vulnerability (Policy Brief 4).

Inclusive IFRM pays adequate attention to women's engagement. Studies show that women's role in the community is pivotal in increasing flood preparedness (such as environmental conservation and flood protection), in responding to flood hazards, and in Building Back Better [24], also discussed in Policy Brief 4. However, women often have the least power in society and are, on the whole, weakly engaged in decision-making. Compared with men, women are among the most vulnerable groups to flood risks due to limited access to resources, income and public services. Gender mainstreaming in IFRM policies and programmes should receive adequate attention, as well as to other vulnerable groups in society.

Stakeholders' Roles and Responsibilities

An IFRM platform that supports adaptation and collaboration of stakeholders is central for generating desired societal, environmental and economic outcomes. This is in contrast to the narrowly defined nature and single objective focus of the flood control paradigm [25]. Such a platform highlights the need to reduce flood risk (for residents, the economy and the environment). It also highlights the creation of opportunities for working with natural processes and promoting multiple ecological, social and economic benefits. IFRM investments can be made more effective and efficient by accounting for potential trade-offs between scarce resources and accrued benefits.

IFRM is effective if implemented across a range of sectoral interests such as flood risk, water resources, development and energy. This requires national, regional and local governments to work together with relevant stakeholders to ensure the integration of multiple policies, regulations and programmes at various levels. Flood management planning requires meaningful horizontal and vertical integration. Disagreements and conflicts can occur between institutions of Greater Jakarta's delta governance due to unclear roles and responsibilities. Even a well-intended IFRM plan may fail due to a lack of clear roles and responsibilities and related budget security. Such clarity bridges the gap across policy, planning, and implementation.

The roles and responsibilities of stakeholders from national, provincial and local government, businesses, communities and individuals should be clearly defined. The nature of IFRM has changed over time, and flood risk has become more connected to many other sectors such as housing, agriculture, health and disaster response. Various government priorities, such as economic development or climate change adaptation, are also relevant here. Although the IFRM community has expanded, the focus must remain centred on the communities at risk. Along with the flood risk due to climate and land-use change, Greater Jakarta's flood-prone areas are rapidly increasing in population. IFRM strategies should first and foremost enhance their flood resilience.

Resource and Cost-sharing

The availability of sufficient resources and their proper allocation is necessary for effective IFRM. The term "resources" broadly includes financial resources, human resources, technological resources (e.g., measuring equipment, communication devices), technical tools, supplies, and equipment (maps, data, and information). Resources should be available and accessible to those who need to implement IFRM. Policies, plans, and procedures for sharing, exchanging and securing additional resources are essential for maintaining IFRM capabilities, also in the case of crises or hazards.

In addition to the availability of resource sharing to enhance stakeholders' flood resilience, a proper pricing mechanism could generate funds that can cover costs incurred due to flood prevention and any loss and damage caused by floods. However, from a social justice and solidarity perspective, the question remains as to what extent risks and associated costs should be borne by the poor, who in many cases inhabit flood-prone areas of Greater Jakarta.

A possible mechanism for cost-sharing in flood risk reduction is where the government provides a basic level of flood protection that corresponds to the lowest flooding level. Costs incurred at higher flooding levels would be divided between national, regional and local authorities.

Conflict Management

Effective stakeholder collaboration can be an important part of conflict management. There is increasing evidence that there is a need for conflict mitigation and prevention in contexts where the natural environment intersects with a social system (also in flooding contexts).[i] IFRM is often applied in complex and dynamic socio-economic and biophysical settings associated with flood hazards and climate change. Therefore, collaboration platforms should include the knowledge and tools to assess whether a certain set of circumstances could lead to conflicts and how to prevent this proactively.

Conflict management does not aim to eliminate conflicts as that may be impossible and not always desirable. Instead, its central aim is to transform existing divergent or conflicting situations to converge peacefully. For social transformation and political change in conflict situations, the most common methods are negotiation, mediation, arbitration, and adjudication or litigation [26].

Even if sufficient knowledge and appropriate conflict management tools were available, the "how" of conflict management in collaborative governance remains challenging. Social learning (pembelajaran sosial) between stakeholders then becomes of crucial importance. The specific capabilities and expertise of each collaborating partner are essential in managing and anticipating existing conflicts.

Multi-stakeholder platforms which encourage learning can help in shifting divergent stakeholder positions from complex, unstructured situations to more manageable parts [27]. This component of the institutional design of stakeholder platforms is important (see Figure 5.1). Furthermore, leadership is most important in guiding stakeholder learning and in assuming strategic and operational decisions. As such, leadership can govern the multi-stakeholder platform with high goal consensus, particularly in situations that could lead to conflicts.

[i] Empirical research on conflicts in Indonesian flooding contexts is limited. The few studies that are available indirectly relate to conflicts, such as Padawangi et al., 2002, 2014, 2016.

Science-Policy-Practice Interface

IFRM in Indonesia is challenged by the silo mentality of sectors, institutions and scientific disciplines. In these fields, a rigid distinction between science, policy and practice is commonplace [28]. Yet, the complex interplays of the social, economic and biophysical systems require a thorough breakdown of such rigidity. Adaptive multi-stakeholder collaboration offers an avenue at the science-policy-practice interface for not solely embracing an engaged practice of science and policy making.

It also helps to find ways to balance the rigour of research with the adaptivity required by the complexities and uncertainties inherent in flood disasters and climate change [29].

The application of an ecoregional approach, discussed above, can drive the breakdown of the science-policy-practice boundaries. A regular assessment of Greater Jakarta's carrying capacity can be a prerequisite for IFRM policymaking. Additionally, it can also be a means to develop knowledge using innovative scientific methods combined with practical and local knowledge.

Multi-stakeholder platforms should be able to facilitate collaborating partners in negotiating their specific needs at the strategic level. They should also help incorporate adaptive management into the institutional design of platforms and the operational stages of IFRM. In this way, the platform allows the co-creation of policies, programmes and implementation plans while addressing distinct agendas of the different stakeholders.

Recommendations

To develop, design, and implement comprehensive capacity building in the Jakarta Metropolitan Area, capacity building activities should take into account the silo working culture within public institutions and the dynamic structural changes that create a barrier to projects and capacity building implementations. Capacity building will then gradually resolve the issues by employing the following recommendations as part of an ideal capacity building model:

Recommendation 1: Ecoregional approach as the foundation of flood governance

- Apply an ecoregional approach as the foundation of Greater Jakarta flood governance by implementing an adaptive spatial planning policy and integrating policies based on ecoregional characteristics of the watershed as a system rather than administrative boundaries.
- Increase awareness amongst policymakers of the importance of an ecoregional approach.
- Redesign governance structure so that it promotes interlinkages, coordination, and coherence between stakeholders, institutions, and sectors as well as adaptiveness and resilience within the ecoregion.
- Promote sustainability by ensuring continuous support and enabling infrastructures and facilities, including the (informal and formal) flow of resources, communication, data sharing, and monitoring platforms.
- Apply the above recommendations by using ACM as an implementation framework.

Recommendation 2: Stakeholder identification and engagement

- Identify stakeholders from the lowest to the highest level of governance who should participate in the new agency that coordinates the Greater Jakarta spatial plan. The stakeholders should represent relevant sectors and include public authorities from different agencies, community groups, academics from relevant disciplines and the private sector. Stakeholder identification can be conducted at a particular governance level for a specific decision-making process.
- Develop guidelines that guarantee an accountable and transparent process to elect stakeholders and develop the agency's collaboration mechanism.
- Facilitate involvement of the stakeholders in all phases of the planning process (planning, implementation, and monitoring) by fostering trust and social capital.
- Give adequate attention to women's participation by creating a gender-sensitive space and, when necessary, provide training and facilitation to ensure their active involvement in decision-making.

Recommendation 3: Appropriate science–policy–practice interface

- Accommodate efforts to cross the boundaries between science, policy, and practice. Focus on policy implementation that puts the interests of different stakeholders.
- Promote evidence-based policies and programmes by ensuring the involvement of credible professionals and researchers in decision-making. Hereby ensure the use of scientifically proven analyses in support of proposed spatial plans, robust instruments for implementation as well as clear mechanisms for impact evaluation.
- Shape the policy and institutional conditions for stakeholders to build capacity (Policy Brief 6) and collaboratively design and conduct relevant research. Build on shared objectives, learning, and experimentation using a pragmatic approach to knowledge development with space for creative hypotheses and collaborative experiments.
- Adopt Adaptive-Collaborative Management (ACM) in the IFRM science-policy-practice interface to embrace an engaged practice of science and policy making.
- Develop IFRM interventions that balance the rigour of scholars with the adaptivity required by the complexities and uncertainties inherent in flood disasters and climate change.

Recommendation 4: Horizontal and vertical synchronisation of roles, authority and stakeholders' rights, and responsibilities

- Give more authority to the special coordinating agency of the Greater Jakarta Urban Spatial Plan to develop a comprehensive plan that integrates spatial planning with FRM and coordinate its implementation with stakeholders in various regions, institutions, and sectors.
- Explore the possibilities to distinguish and allocate roles and responsibilities for i) IFRM policymaking, ii) policy implementation, iii) operational management and regulation, and iv) coordination across responsible authorities. The distribution of roles and responsibilities should span scales ranging from national to subnational and basin levels as well as across sectors relevant for Greater Jakarta. In addition to public works institutions, spatial planning and water resource sectors, the following sectors should also be included: housing, social affairs, education, health, agriculture, disaster risk management and climate change mitigation and adaptation.
- Create a horizontal and vertical coordination structure with clear roles, authority, and responsibilities of all stakeholders involved and develop fiscal schemes that support them in doing their tasks.
- Synchronise IFRM policy, regulations and programmes with a spatial plan component at various levels.
- Create a decision-making mechanism that ensures the participation of different stakeholders. Appropriate IT-based support systems can add structure and strengthen this mechanism.
- Allow the coordination agency to have the authority to demand stakeholders involved to fulfil their responsibilities in carrying out the collective decisions. This authority should have sufficient and appropriate resources such as budget, technology and capable manpower.
- Develop a clear risk-sharing and compensation mechanism to ensure trust among stakeholders.
- Explore and develop proper alternative funding mechanisms to cover costs of flood prevention and loss and damage due to flood hazards that are in line with a social justice and solidarity perspective.

Recommendation 5: Conflict management mechanism

- Develop a clear shared vision and learning environment among stakeholders.
- Provide space for negotiation, mediation, arbitration and adjudication to managing conflict between stakeholders.
- Use ACM as a learning-based approach to manage and anticipate IFRM disagreements or conflicts by inserting learning and collaboration in the institutional design of collaboration platforms.
- Develop institutional or individual leadership that facilitates stakeholder learning and assumes strategic and operational decisions.

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POLICY BRIEF 6

Towards a Climate-Resilient Jakarta: Recommendations for Comprehensive Capacity Building

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DUTEP 2017 participants and tutors.
Photo by: Dutch Training and Exposure Program (DUTEP).

Executive Summary

The Jakarta Metropolitan area is the largest metropolitan area in Indonesia in terms of population size and economic contribution. However, decades of rapid urbanisation have brought with it enormous challenges.

One of these challenges is the annual flooding of large parts of the metropolitan area. Special attention now needs to be paid to the northern Jakarta region, which is one of the flood-prone areas. Local governmental plans, projects and programmes have been developed to minimize the impact of flood events. The national government has published a policy to integrate spatial planning in the metropolitan area for improved flood management. Policy briefs 3, 4 and 6 discuss this national policy in more detail.

During the implementation of the various governmental plans, projects and programmes, strong human capacity is crucial. Strong human capacity does not just happen but needs to be continuously built and nurtured. In enhancing the capacity of the local government officials in the metropolitan area, two main problems remain a barrier: a silo working culture and sudden dynamic structural changes within local government bodies. Best practices mentioned in this policy brief show that human capacity building can help to improve the situation but needs to be done step by step and requires continuous focus.

Introduction

As the largest and most populous metropolitan area in Indonesia, Jakarta Metropolitan Area is the predominant economic driver. The province itself contributes 17,7% to the national economy, the largest in Indonesia [1].Despite this economic success, the area is facing tremendous environmental challenges, such as flooding, land subsidence, poor water quality and air pollution. These challenges are worsened due to the impacts of climate change such as extreme weather and sea-level rise. These impacts have affected the lives of more than thirty-eight million inhabitants across the Jakarta Metropolitan Area [2].

What if, 10 years from now, Jakarta is regarded as a highly desirable city to live in, commute to and for recreational activities? Picture an urban area where there is room for water in rivers and lakes and where water can be discharged in rivers and from there into the sea. The attractive coastline will protect the city from flooding and the green city will provide shade for residents and improve air quality. Inner city and suburban communities will have sufficient living space. An extended public transportation network will make commuting convenient and cause a substantial reduction of air pollution and greenhouse gas emissions. This modern metropolitan city will attract investors from across the world, while residents of all social groups and tourists will enjoy Jakarta's coastline, parks and network of green belts.

To make this vision a reality, the Metropolitan Area is in urgent need of a comprehensive flood management system to enable climate mitigation and adaptation. This policy brief refers to technical and non-technical elements, for example, sufficient space for water to flow downstream via rivers, adequate drainage systems for heavy rainfall, urban water cycle planning, information technology for water management. The capacity to innovate, resolve issues, and prepare communities for floods are also essential elements.

To have, implement and maintain a sustainable, comprehensive flood management system, strong human capacity is required. Government officials of the Jakarta Metropolitan Area need a strong vision and willingness to move forward. They will have the support of competent Human Resources staff and capable local government departments. Capacity building activities are essential for improving and broadening the knowledge of government officials in various local government departments. Capacity building also connects knowledge, requirements and interdependencies for effective decision making in policy development. In this way, actions can be taken and resources allocated in a rational way in order to solve flood issues and cope with the impacts of climate change. This program can be used as a model for other cities in Indonesia that are experiencing the same problems.

Key Messages and Recommendations

Capacity building is necessary for developing a comprehensive flood management system as a means of climate mitigation and adaptation for a climate-resilient Jakarta.

Jakarta needs a climate-resilient, sustainable and future-proof urban environment. That requires integrated planning and development with a strong human capacity. Building the capacity of Human Resources in institutions has been proven essential to achieving climate resilience. Human capacity requires leadership, cooperation, broad competencies and the knowledge of specific topics and issues. It also requires the ability to understand, develop, strengthen, implement and evaluate a plan, project or programme. Without strong human capacity, moving from plan to action is difficult. This policy brief highlights the best practices from three selected capacity building activities in Jakarta. These examples provide insight and practical tips on how to strengthen Jakarta's human capacity and create a climate-resilient Jakarta.

Strong human capacity is an important success factor in creating a strong, sustainable and future proof urban environment. Human capacity means the ability to understand, develop, strengthen, implement, and evaluate a plan, project or programme. This includes leadership, broad competence on specific topics and issues as well as cooperation. Without strong human capacity, moving from plan to action is difficult. Creating a climate resilient Jakarta calls for integrated planning and development with a strong human capacity. Building the capacity of human resources in institutions dealing with related issues and plans on a daily basis is proven as an essential attempt to achieve climate-resiliency. This policy brief highlights best practices from three selected capacity building activities in Jakarta. The examples give insight and practical tips on a way forward to strengthen Jakarta's human capacity to move towards the creation of climate resilient Jakarta.

Two primary issues have been identified within Jakarta's work environments: the silo mentality and dynamic structural changes within the local government. These two issues hinder knowledge exchange. To ensure that capacity building activities are effective, they must be designed to reduce the existing silo mentality and cope with dynamic structural changes. We have selected several elements that strengthen human capacity:

- **Frequency and duration** are important elements of capacity building, as trajectories are relatively short, whereas organisational change can take several years.
- **Format and content** are crucial elements for building awareness where cross-sectoral collaboration is needed to solve urban issues that are often complex.
- **Financial support and follow-up activities** are needed to cope with the impact of governmental structural changes.

Capacity building activity during DUTEP program. Photo by: DUTEP.

Problem Statement and Challenges

There are two primary issues in local government working environment: first, the silo working culture and second, dynamic structural changes within government bodies.

Achieving a strong urban system with effective human capacity is a challenge. This is especially the case with a large metropolitan area such as Jakarta which is undergoing rapid urbanisation and growth. The metropolitan area and its government officials are required to deal with many complex issues. The authors of this policy brief identify the following two cultural aspects as having a limiting effect on capacity building activities in Jakarta.

- The silo working culture within the local government departments at both provincial and municipal levels. The Indonesian local government is organized by functional departments. There is little interaction between different governmental bodies. Each organisation has their targets and goals which makes collaboration more difficult. In a fast-growing agglomeration, a department focussed organisation is more likely to achieve specific targets. However, moving the metropolitan area to a climate, flood and future proof urban-environment calls for integrated actions.
- The dynamic structural changes within government bodies. The individual human capacity in the Jakarta Metropolitan Area is strong and there is a willingness to create a more future-proof environment. However, this alone does not lead to results as the government is structured based on capacity needs per department. Every three months, the required capacity in different departments is evaluated and employees are swapped between departments. This approach ensures that the direct needs and capacity requirements are met. However, the strengthening and transfer of knowledge are limited. As a result, many ongoing programs and projects are delayed or even cancelled due to personnel changes. When this occurs, capacity and knowledge must be rebuilt when and if the program or project resumes.

Considering the two aforementioned issues, this policy brief provides several practical recommendations to strengthen human capacity in the Jakarta Metropolitan Area. The recommendations in this policy brief are drawn from the Authors' reflections and professional experiences in the relevant capacity building activities and close interactions with various stakeholders in the Jakarta Metropolitan Area.

Objectives

This policy brief aims to clarify specific relevant issues, inspire organisations and give practical recommendations for relevant stakeholders in the Jakarta Metropolitan Area. It applies to both private and public entities in planning, designing, and implementing a comprehensive capacity building activity. As mentioned in other policy briefs in the present series, the focus is on dealing with floods in times of climate change.

Lessons Learned from Best Practice Capacity Building Efforts

Various capacity building activities have been implemented for government officials in the Jakarta Metropolitan Area. Some of these were initiated by the local government department, others were related to projects and programmes across Indonesia's metropolitan areas. Before presenting recommendations, the Authors have selected three best practices of capacity building activities conducted in the Jakarta Metropolitan Area and other areas in Indonesia. Each best practice provides meaningful insights in formulating an ideal capacity building model and serves as a basis for the recommendations presented in this policy brief.

Exposure – The Dutch Training and Exposure Program (DUTEP)

The Dutch Training and Exposure Program (DUTEP) started in 2014 as a bilateral capacity building program focused on integrated urban water management between Rotterdam and Jakarta. In 2020, the program was reviewed and developed to be continued into 2021 and beyond. During this program, selected government officials from various local government departments of DKI Jakarta Provincial Government were trained and sent to work in water-related organisations in The Netherlands for twelve weeks (3). This program provides participants with hands-on experience and the opportunity to learn best practices from Rotterdam's situation and Dutch organizations. This training also includes weekly meetings between the participants and tutors to reflect on the learning objectives, peer-review and assignments.

This training model has not only proven beneficial for the individuals involved but also the local government departments. It provides the understanding that urban issues are often multifaceted, requiring an integrated solution that considers all aspects. Within twelve weeks, the government officials learn how to work in an integrative manner across sectors, broaden their knowledge of complex water management issues and learn best practices from The Netherlands. In addition to this, they also learn how to increase social bonding between government employees which is important for breaking the silo working culture.

Training Activities - in Integrated Coastal Zone Management (ICZM) Project

Training activities can be made an integral part of project implementation, as demonstrated by the Integrated Coastal Zone Management (ICZM) project in Central Java Province. This project was done in collaboration with the following Dutch and Indonesian public and educational institutions: IHE Delft, Deltares, Radboud University Nijmegen, Diponegoro University (UNDIP), Public Works and Spatial Planning Service Unit, Marine and Fishery Service Unit, and Development Planning Agency (BAPPEDA) Central Java Province. The training was given at different levels within the organisations, starting with university, provincial government, city government, district manager and village manager positions. The training activities were designed with a primary focus on learning-by-doing. The objective of the ICZM capacity development project was to develop the capacity of several institutions at different levels in an integrated way for the coastal zone management of the northern coast of Central Java. Online and offline training, short courses, workshops, discussions and field studies were organized. The Pekalongan area was selected as the case study area.

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Implementation - Capacity Building Activities in 100 Resilient Cities (100RC) Programme

In 2017, DKI Jakarta Province was selected as one of the cities to participate in the 100 Resilient Cities (100RC) programme initiated by the Rockefeller Foundation. The objective of this programme is to showcase selected cities that demonstrate a resilient city concept and to assist other cities to develop their resilient city strategy. As a result of this program, DKI Jakarta Provincial Government published a resilient city strategy in 2019 (4). During the two-year programme, the focus is not only on developing a resilient strategy, but also on building the capacity of local government departments to run the resulting strategy and translate it into policies, regulations, and actions by themselves.

The capacity building activities were implemented using various approaches, such as workshop sessions with experts from public and non-public institutions as well as peer-to-peer learning with Semarang City Government. They had already successfully developed and implemented the strategy under a similar programme. In addition to this, the Rockefeller Foundation also provided an online knowledge platform that can be accessed freely and offers a city matching functionality and provides peer-to-peer learning opportunities. In this way, the capacity building activities have been successful in building a sense of belonging and the capacity to collaborate with other stakeholders. However, the process also showed that there was a high dependency with 100RC Strategic Partners in developing the strategy, rather than the Strategic Partners who were initially presented to assist the Provincial Government in the strategy development.

Capacity building activity during 100 Resilient Cities program. Photo by: Resilient Jakarta Secretariat.

Results and Recommendations

To develop, design, and implement comprehensive capacity building in the Jakarta Metropolitan Area, capacity building activities should take into account the silo working culture within public institutions and the dynamic structural changes that create a barrier to projects and capacity building implementations. Capacity building will then gradually resolve the issues by employing the following recommendations as part of an ideal capacity building model:

Multi-stakeholder cooperation in practice

For each urban development project, it is necessary to reach out to other governmental bodies at national and local levels to foster cooperation and create a shared plan. It is important to consider all issues and interests of different local stakeholders so that the solutions and development advantages can be felt by all concerned. To achieve this, the capacity building activities should select participants from different stakeholder roles within various sectors. Putting this recommendation into practice will help to overcome the silo working culture and enable cooperation between different governmental bodies. Cooperating with other stakeholders in a practical environment creates shared understanding and inclusive solutions. Policy brief 3 also discusses the need for multi-stakeholder platforms for effectively addressing the flooding problem. Furthermore, Policy brief 4 identifies the need for transboundary collaboration that goes across sectors, institutions, governance levels and scales.

Exposure to issues and best practices

Government officials and decision-makers travel and experience first-hand the issues faced by other governments and international cities and the best practices applied to resolve them. It is recommended that employees at an operational level would also benefit from experiencing (international) best practices. This can be achieved by creating networks and connecting government officers to peers in other cities. For example, a buddy program can provide them with hands-on experience and insights. In this way, government officials broaden their knowledge of how things are done in other cities and countries and lessons learned can be applied in their work.

Duration and frequency

Dynamic structural change is also a key barrier in knowledge transfer between individuals within a governmental body. To overcome this issue, capacity building activities must be recurrently organized. In this way, the knowledge can be distributed evenly and government officials can also refresh what they have learned from previous activities. To do this effectively, sufficient budget and time should be allocated by government institutions to organize these capacity building activities. If any governmental institutions are not able to fund these activities, it is also possible for governmental institutions to collaborate with external parties or educational institutions.

Broad competence development

Capacity building activities must focus on developing a set of necessary capacities and competencies other than purely technical in nature. The materials provided explain how urban environments are complex adaptive systems with non-technical competencies such as administrative, institutional and governance capacity. The importance of working across sectors and administrative boundaries will be developed and become the default mode of work.

In addition, broad competence is also needed for policymakers, planners and project implementers to effectively target the Sustainable Development Goals (SDGs) and simultaneously reduce flood risk reduction as well as to adapt to climate change. The need for such an integration is discussed in Policy Brief 4. Capacity building is needed to build technical, communication and collaborative capacity in the following areas: science-based integrated programming and implementation related to SDGs, Disaster Risk Reductions (DRR) and CCA; planned adaptation (Policy Brief 4) and the use of climate adaptation tools (Policy Brief 1); nature-based solutions (called soft measures in Policy Brief 2); and communication and collaboration with local experts and professionals and business in these fields.

Achieving the SDG goals requires substantive additional capacities in the water sector as well as a change in mindsets. It is also recommended that the technical training should be combined with so-called meta-skills training (e.g. design capacities), as well as develop behavioural skills that support implementation by way of (on-the-job) training.

Participant's profile mix

The government participants should be a representative mixture of age, position and rank. In addition to this, the participants should be selected from different sectors of local government departments as most decisions are made by higher-ranking government officials while the implementations are made by lower-ranking government officials. In this way, knowledge will be disseminated across sectors and hierarchies.

Follow-up activity

The Research and Development Unit within the Provincial and Municipal Government should develop and maintain a free online learning or knowledge platform that can be accessed freely and updated as a knowledge database for capacity building. Optional activities such as reunions can also be arranged to maintain social bonding among different government officials and enable them to work in a more integrative way.

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Glossary and Abbreviations

A

Adaptation
Please see **Climate change adaptation.**

Adaptive capacity
The ability of a system to adapt to the effects and impact of climate change. Adaptive capacity greatly influences the vulnerability of communities and regions to climate change effects and hazards (Smit and Pilofosofa, 2001).

B

Biological hazards
These are of organic origin or conveyed by biological vectors, including pathogenic microorganisms, toxins and bioactive substances. Examples are bacteria, viruses, parasites, venomous wildlife, poisonous plants and mosquitoes carrying disease-causing agents (UNDRR, 2017).

Build Back Better
The recovery, rehabilitation and reconstruction phase after a disaster. This phase aims to increase the resilience of nations and communities by integrating disaster risk reduction measures into the restoration of physical infrastructure and societal systems and into the revitalisation of livelihoods, economies and the environment (UNDRR, 2017).

C

Capacity
The combination of all the strengths, attributes and resources available within an organisation, community or society to manage and reduce disaster risks and strengthen resilience (UNDRR, 2017).

Capacity assessment
The review of the capacity of a group, organisation or society against desired goals, where capacity gaps and capacity maintenance and strengthening actions are identified (UNDRR, 2017).
Capacity development: The process by which people, organisations and society systematically stimulate and develop their capacities over time to achieve social and economic goals. This extends capacity-building to create and sustain capacity growth. It involves various types of training and continuous efforts to develop institutions, political awareness, financial resources, technology systems and the wider enabling environment (UNDRR, 2017).

Climate change adaptation
This refers to the process of adjustment to the actual or expected climate and its effects. In human systems, this adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may cause a change to the expected climate and its effects (IPCC, 2014).

Complex adaptive system
A large system characterised by numerous heterogeneous agents where each agent makes decisions about its behaviour and interact with other agents. That interaction leads to something that scientists call emergence, where the whole system is greater than the sum of its parts. The system cannot be understood by only looking at its parts (Harvard Business Review, 2011).

Coping capacity
The ability of people, organisations and systems to manage adverse conditions, risks and disasters using available skills and resources. Coping capacity requires continued awareness, resources and good management, both under normal conditions and during disasters or adverse conditions. Coping capacity contributes to the reduction of disaster risks (UNDRR, 2017).

D

Damage Scanner
A flood damage model that needs the following three inputs: (a) a map showing the inundation extent and depth for representing a given hazard; (b) a land use map, with associated economic values of each land use class, for representing the related exposure; and (c) depth-damage functions for representing the associated vulnerability (Budiyono et al., 2015).

Disaster
A serious disruption in the ability of a community or a society to function at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental loss and impact (UNDRR, 2017).

Disaster risk
The risk of injury, loss of life and destruction or damage to the assets of a system, society or a community during a specified period of time. This risk is determined probabilistically as a function of hazard, exposure, vulnerability and capacity (UNDRR, 2017).

Disaster risk reduction
This aims to prevent and reduce new and existing disaster risks and manage residual risk. This contributes to strengthening resilience and achieving sustainable development (UNDRR, 2017).

DKI Jakarta Province
Special Capital Region of Jakarta (Daerah Khusus Ibu Kota Jakarta). See also Greater Jakarta.

DRR
see **Disaster Risk Reduction**.

E

Ecoregion
A large area of land or water that contains a geographically distinct assemblage of natural communities that share a large majority of their species and ecological dynamics; share similar environmental conditions, and interact ecologically in ways that are critical for their long-term persistence. (WWF, n.d.).

Environmental hazards
These may include chemical, natural and biological hazards. They can result from environmental degradation and physical or chemical pollution in the air, water and soil. However, many processes and phenomena that fall into this category may be termed drivers of hazards and risks rather than hazards, such as in the case of soil degradation, deforestation, loss of biodiversity, salinization and sea-level rise (UNDRR, 2017).

Exposure
The situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas.

F

Flood risk
A function of the flood hazard, the exposed values and their vulnerability (Kron, 2002).

G

Greater Jakarta
This Policy Brief series interchangeably uses the terms Greater Jakarta, Jakarta metropolitan area and JABODETABEK-PUNJUR in referring to the geographical area that comprises the Special Capital Region of Jakarta (DKI Jakarta Province); parts of Bogor, Bekasi and Cianjur Regencies (West Java Province), Tanggerang Regency (Banten Province); as well as (parts of) the satellite cities of Depok, Bogor, Bekasi, Tanggerang and South-Tanggerang; and the Puncak area that is part of Bogor and Cianjur Regencies (West Java Province). JABODETABEK-PUNJUR is generally used in official documents and in mass media.

Geological or geophysical hazards
These originate from internal geological processes. Examples are earthquakes, volcanic activity and related geophysical processes such as mass movements, landslides, rockslides, surface collapses and debris or mudflows. Hydrometeorological factors are important contributors to some of these processes. Tsunamis are tricky to categorize, as, although triggered by undersea earthquakes and other geological events, they essentially become an oceanic process classified as a coastal water-related hazard (UNDRR, 2017).

H

Hazard
A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation (UNDRR, 2017).

Hazard mitigation
Actions taken to reduce loss of life and property by lessening impacts of adverse events (US Government Accountability Office, 2016).

Hydrometeorological hazards
These are of atmospheric, hydrological or oceanographic origin and include tropical cyclones (also known as typhoons and hurricanes), floods (including flash floods), drought, heatwaves, cold spells and coastal storm surges. Hydrometeorological conditions may also affect other hazards such as landslides, wildland fires, locust plagues, epidemics and the transport and dispersal of toxic substances and volcanic eruption material (UNDRR, 2017).

I

IFRM - Integrated Flood Risk Management
This approach combines different measures for accommodating water. It considers other land-use functions such as housing, recreation, and nature conservation and the extent to which these measures increase local and regional spatial planning.

J

JABODETABEK-PUNJUR
Please see Greater Jakarta.

Jakarta metropolitan area
Please see Greater Jakarta.

M

Mitigation measures
Any activity or procedure that is implemented before and during a flood, so that the impact of or loss caused by the event can be predicted and avoided or reduced" (Genovese and Thaler, 2020, p. 460).

Multi-hazards:
(1) The multiple major hazards that the country faces. (2) The specific contexts where hazardous events may simultaneously occur over time, cascadingly or cumulatively (UNDRR, 2017). Any potential interrelated effects are also relevant here.

O

OECD
The Organisation for Economic Development and Co-operation is an intergovernmental economic organisation with 38 member countries, founded in 1961 to stimulate economic progress and world trade (Website OECD, 26 Sept. 2021).

One Data Indonesia
One Data Indonesia (SDI) is a government data management policy that aims to create quality data, which is easily accessible, and can be shared between Central and Regional Agencies. This policy is contained in Presidential Regulation no. 39 of 2019 concerning One Indonesian Data. Through SDI, all government data and other relevant agency data can lead to the One Data Indonesia Portal (data.go.id) (One data Indonesia, n.d.).

P

PZ - Peraturan Zonasi
This tool controls the use of space requirements and provisions arranged for each block / zone designation (UU No. 26 Tahun 2007 tentang Penataan Ruang/Law No. 26 of 2007 concerning Spatial Planning).

R

RDTR - Rencana Detail Tata Ruang
This is a detailed regional spatial plan equipped with zoning regulations (website BIG).

Representative Concentration Pathways (RCPs)
Scenarios that include time series of emissions and concentrations of the full suite of greenhouse gases (GHGs) and aerosols and chemically active gases, as well as land use/land cover (Moss et al., 2008). The word representative signifies that each RCP provides only one of many possible scenarios that would lead to the specific radiative forcing characteristics. The term pathway emphasises that not only the long-term concentration levels are of interest, but also the trajectory taken over time to reach that outcome (Moss et al., 2010).

Resilience
The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner. This includes the preservation and restoration of essential basic structures and functions through risk management (website UNDRRR).

RTRW - Rencana Tata Ruang Wilayah
This is a general spatial plan for a national/provincial/district/city area (website BIG).

S

SDGs
The Sustainable Development Goals or Global Goals are a collection of 17 interlinked global goals designed to be a "blueprint to achieve a better and more sustainable future for all" (United Nations 2017).

SFDRR - Sendai Framework for Disaster Risk Reduction
This was the first major agreement of the post-2015 development agenda and provides the Member States with concrete actions to protect development gains from the risk of disaster. The Sendai Framework works hand in hand with the other 2030 Agenda agreements, including The Paris Agreement on Climate Change, The Addis Ababa Action Agenda on Financing for Development, the New Urban Agenda, and ultimately the Sustainable Development Goals. It was endorsed by the UN General Assembly following the 2015 Third UN World Conference on Disaster Risk Reduction (WCDRR), and advocates for: The substantial reduction of disaster risk and loss of life, livelihoods and health impacts and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries (UNDRR Website).

Strategic Environmental Assessment (SEA)
- in Indonesian Kajian Lingkungan Hidup Strategis (KLHS)
'The process of predicting and evaluating the impact of a strategic action on the environment, and using that information in decision-making.' (Planning Tank, 2021)

Systemic risk
A risk that is inherent to or embedded in a system that is not itself considered to be a risk and is therefore not generally tracked or managed, but which is understood through systems analysis to have a latent or cumulative risk potential to negatively impact overall system performance when some characteristics of the system change (UNDRR, 2019).

T

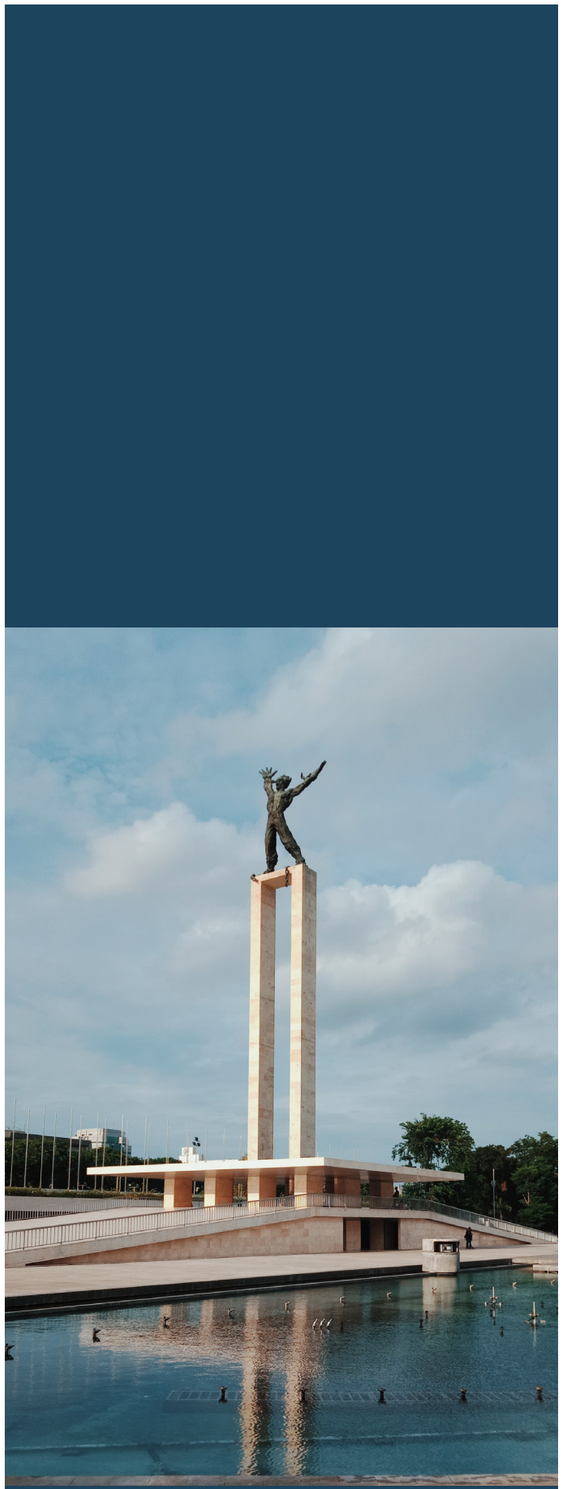
Technological hazards
These originate from technological or industrial conditions, dangerous procedures, infrastructure failures or specific human activities. Examples include industrial pollution, nuclear radiation, toxic waste, dam failure, transport accidents, factory explosions, fires and chemical spills. Technological hazards also may arise directly as a result of the impacts of a natural hazard event (UNDRR, 2017).

U

UNFCCC
The United Nations Framework Convention on Climate Change established an international environmental treaty to combat "dangerous human interference with the climate system", in part by stabilizing greenhouse gas concentrations in the atmosphere (Article 2, UNFCCC 2016).

V

Vulnerability
The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards (UNDRR, 2017).



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Brief Profile of the Initiators

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Trikurnianti (Yanti) Kusumanto is Owner of and Sr. Consultant of TYK research & action consulting, The Netherlands. She holds a Master's degree in Tropical Agronomy, Development Economics and Forest Policy. Prior to delivering consultancy starting in 2013, for over 20 years her work was on development co-operation in rural development and forest management; civic society building; and social science research. Since more recently, her work has included urban development. She was affiliated with CGIAR and has delivered consultancy on e.g., FAO and Worldbank projects. Her work has covered Southeast Asia and reached out to India, China, Asia-Pacific and parts of Africa.

Indonesian Diaspora Network the Netherlands Taskforce Liveable Cities (IDN-LC)

Wiwi Tjiook is Coordinator of Taskforce Liveable Cities of Indonesian Diaspora Network The Netherlands (IDN-NL) and a Board Member of IDN-NL. Graduated with an MSc degree in Landscape Architecture from Wageningen University, her expertise is in landscape and urban design, with a passion for integrated water and landscape planning. As a landscape architect at Rotterdam Municipality, she is one of the coaches for staff of DKI Jakarta within DUTEP (Dutch Training and Exposure programme). On behalf of IDN Liveable Cities she was part of a consortium focusing on Semarang in the Water as Leverage for Resilient Cities programme. Her design works covered Southeast Asia, United Kingdom, Australia and The Netherlands.

Utrecht University

Dr. Annisa Triyanti is a postdoctoral researcher and lecturer on water and climate governance in deltas at the Copernicus Institute of Sustainable Development, Faculty of Geosciences, Utrecht University, The Netherlands. She holds a Ph.D. degree from the University of Amsterdam on ecosystem-based disaster risk reduction (DRR) governance. She was a human geography lecturer at Universitas Gadjah Mada, Indonesia (2013-2017). She was appointed as young scientists' representative to the Global Science and Technology Advisory Group of the UN Office for Disaster Risk Reduction (2017-2019), working on the interface of DRR, climate change, and sustainable development.


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West of
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Bogor Indonesia


BPPT


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