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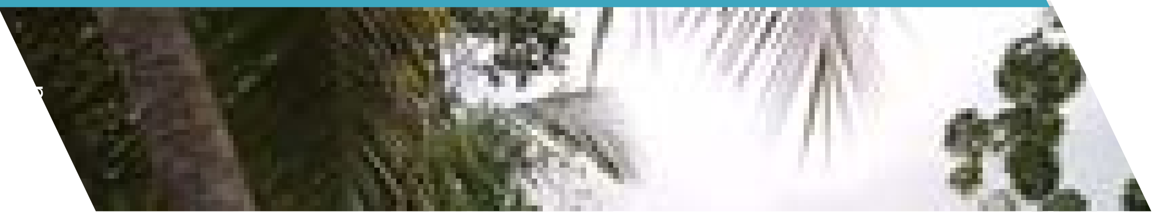
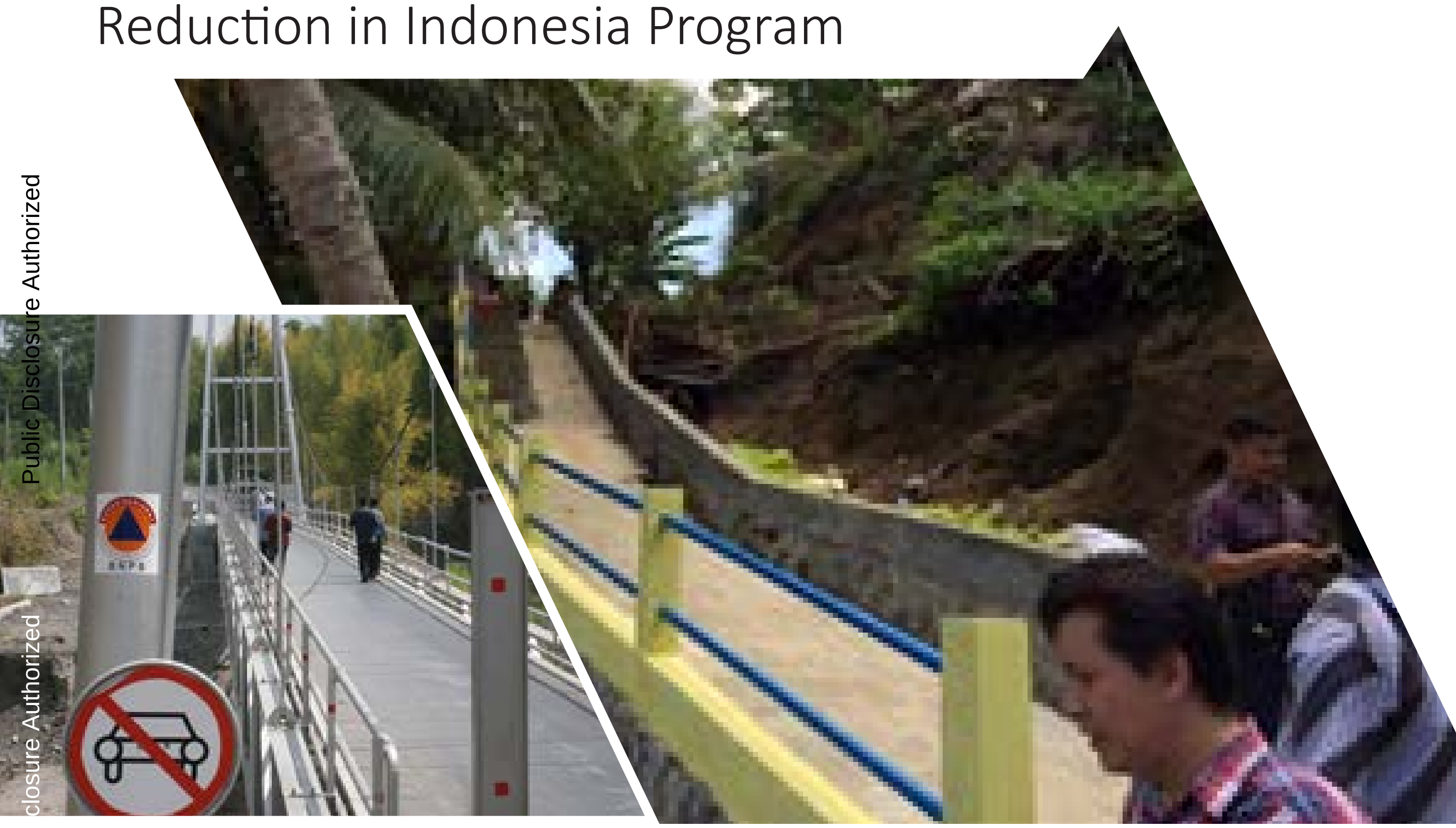
Building Indonesia’s Resilience to Disaster:



Experiences from Mainstreaming Disaster Risk Reduction in Indonesia Program



A report for the implementation of P122240 – Mainstreaming Disaster Risk Reduction in Indonesia Phase II Programmatic Advisory Services Analytics

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Global Facility for Disaster Reduction and Recovery

Contents

1.0. Introduction

As a country highly vulnerable to disasters, Indonesia has made a remarkable achievement in bringing disaster risk management to the forefront of its development agenda. The Mainstreaming Disaster Risk Reduction in Indonesia Program is the World Bank engagement with the Government of Indonesia supported by the Global Facility for Disaster Reduction and Recovery (GFDRR). The program, which started in 2009, has the rare opportunity to complement the full cycle of National Mid Term Development Plan for 2009-2014, which also coincides with the conclusion of the Hyogo Framework for Action.

This report summarizes the works undertaken under the program providing information about the context in which he Government is building its Disaster Risk Management institutions and capacities, and highlighting the key activities of the program in leveraging the Government's efforts. The activities were organized following the five-pillar structure of Disaster Risk Management (DRM) adopted by the GFDRR (Figure 1). The report aims to capture the experiences and lessons in making DRM becomes everybody's business, and to confirm that such a mainstreaming approach is possible, even in the context of a highly vulnerable, geographically diverse, and socially complex country like Indonesia.

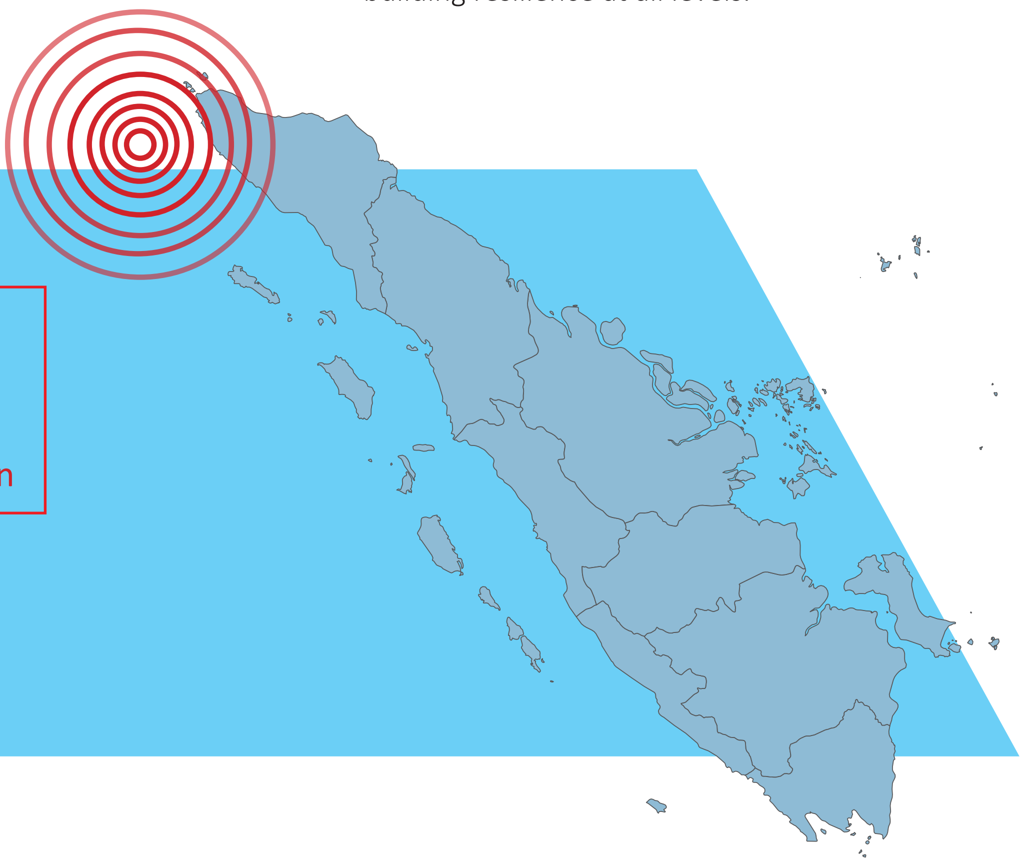
Figure 1. Five Pillars of Action adopted by the GFDRR

2.0. The 2004 Tsunami: Hard Lesson and Move On

December 26, 2004 is a wake up day for Indonesia's disaster management. The one in 200 years tsunami that hit a territory long engulfed in conflict generating casualties of more than 200,000 and causing USD 2 billion of direct impact gave Indonesia a hard lesson in many aspect of the country's development. Failure of governance and social justice, physical development that did not consider disaster risks, and many other factors all leading to one important lesson that "hard fought development which did not consider the interaction among and between people and nature could fail in a matter of minutes".

There are typically two options that such a hard lesson could lead to: 1) ripple effect that leads to total collapse, or 2) a bounce back that allows the system to recover and build coping capacity to future similar occurrences. Indonesia has done just exactly the latter. The reconstruction of Aceh and Nias, two most affected areas, was deliberately designed as a 'special project' that has ambitious goals and was carried out with special privileges. But, given the geographic size and complexity of Indonesia, the Government quickly realized that his 'special project' needs to be scaled up through building institution and capacity at all levels to reach more than 500 districts and municipalities spread in about more than one thousand inhabited islands.

Indonesia learned that the Aceh Tsunami was not the only such risk confronting the archipelago, a series of similarly devastating disasters occured in 2006 with earthquake in Yogyakarta and Central Java and tsunami on the southern coast of West Java. This serves as confirmation that Indonesia should look at past experiences, but it definitely needed to move-on focusing on building resilience at all levels.



200,000

USD 2 billion

3.0. The Baseline: Rapidly Developing Vulnerable Country

If statistics were an accurate indication of probability for future disaster occurrences, Indonesia certainly qualifies as one of the most vulnerable countries on earth. Based on EM-DAT, there are approximately 464 major disasters that had occurred in Indonesia between 1900 and 2016 killing more than 240,000 people, putting the country at the top rank. Data from Indonesia Disaster Data and Information (DiBi), there are on average 1.164 disaster events annually during the period of this Program.

Indonesia's location along the Pacific Ring of Fire contributed to the high seismicity and volcanism. With an average annual rainfall of 2,000 mm, among the highest in the world archipelagos, climate induced disasters such as flood, drought and landslides are also quite common. In fact, the most frequent disasters in Indonesia is flood at 103 event followed by landslides with 63 events only for the period of peak rainy season from January to February 2016 alone.

The increased risk to these natural events is contributed by the rapid development of the country in the last 25 years where a number of physical assets built, albeit not all meeting seismic resilient standard, have quadrupled from the same period before. Indonesia also experienced rapid urbanization where may built assets and settlements are concentrated in urban areas and often in locations not suitable for development, such as along the riverbanks or in landslide prone areas. It is estimated that 80 percent of Indonesia's population are exposed to the two most common hazards, flood and landslide.

It is against this backdrop that Indonesia's development is placed. The country's efforts to eradicate poverty and boost shared prosperity needs to internalize disaster and climate risks to ensure that the hard earned growth and equality will not be taken aback by shocks brought by the disasters.

90%

Indonesia's population are exposed to the two most common hazards, **flood** and **landslide**.

4.0. Key Results from Mainstreaming Resilience in Indonesia

4.1. Risk Identification

The Program's effort to facilitate risk identification was started with the development of risk map (atlas) at the national scale, which shows spatial distribution of risk (as a function of hazard, vulnerability and capacity) using district boundary as the smallest unit. This initial risk mapping exercise in 2009 was carried out while BNPB was just beginning to recruit staffs from other government agencies. Experts from universities and research agencies were mobilized to provide the technical knowhow on the method to represent different variables in a series of composite maps showing risk to different hazards. While this set of maps is far from perfect, it provides the impetus of identifying areas with more significant relative risks for interventions to be directed. The maps generated from this activity were first included in the National Action Plan for Disaster Risk Reduction for 2009-2012 and subsequently in the National Disaster Management Plan for 2009-2014. The later is a formal planning reference mandated by the Law 24/2007 on Disaster Management.

To-date, BNPB has further experimented with methodology to downscale the risk mapping to the provincial level, providing guidance for sub-national governments to prioritize their risk reduction efforts in sub-districts that have higher relative risk level. Similarly, national level risk mapping for the subsequent National Disaster Management Plan for 2015-2019 was carried out by BNPB using its own internal capacity. The Program continues to provide support in piloting similar risk mapping approach for the education sector to assist the Safe School initiative.

While risk map/atlas at national and provincial level provides very useful and necessary basis for prioritizing actions, the field level measures to reduce risk will require higher resolution geospatial data and analysis. As systematic nationwide mapping at large scale (up-to 1:5,000) has not yet covered the entire archipelago, base maps for such detailed risk identification are not generally available. The Mainstreaming DRR in Indonesia Program was among the first to work with the Government to champion the use of alternative and innovative geospatial data generation approaches to fill in this data gap.

Confronted with the need to provide higher resolution map of flood prone areas in the City of Jakarta, the Program joined forces with the Provincial Disaster Management Agency (BPBD) of Jakarta and the Australia Indonesia Facility for Disaster Reduction (AIFDR) and Humanitarian OpenStreet Team (HOT) as well as UN-OCHA to carry out **the first government-sponsored** participatory mapping (crowd sourcing) in the history of the City. This participatory mapping exercise produced for the first time the neighborhood (RW) maps of the city as well delineating more than 8,000 facilities identified as critical to flood preparedness. This initiative then grew by introducing the involvement of more government agencies in the mapping process to address similar data gap in Mt. Merapi in Yogyakarta and Central Java, where areas which were affected by the 2010 eruption of the volcano had not been mapped, while there was urgent need for hazard rezoning which would affect many community owned lands and settlements. The **Collaborative**

Mapping approach was first introduced by the Program, referring to participatory mapping involving sectoral agencies mandated to produce key geospatial data for public use (e.g., volcanology agency, river authority, land registry, etc.).

The accompanying Technical Note Number 1 provides a summary of experiences of the Program in investing in Risk Information in a rather comprehensive manner to support major metropolis like Jakarta. While supporting Jakarta in itself was a major undertaking, the Program took advantage on the experiences gained to expand to the experimentation of Collaborative Mapping to respond to urgent and growing geospatial needs as summarized in the accompanying Technical Note Number 2.

4.2. Preparedness

While risk maps provide important indication to prioritize risk reduction actions and measures, their most essential utilization is to increase preparedness to reduce loss of life in the event of a disaster. The Program also entered into strategic collaborated with the BNPB and AIFDR in developing open-source geospatial tool for disaster preparedness known as the InaSAFE. The system provides a tailored application, which allows non-expert users to conduct simple disaster scenario assessment to determine and prioritize allocation and placement of logistics and assets (e.g., food, water, shelters) in preparation for disaster emergency.

To ensure that InaSAFE has relevance to the preparedness efforts of the sub-national governments through their Provincial/ District Disaster Management Agency (BPBDs), the system uses a national minimum standard of emergency logistics issued by the BNPB. This had allowed the newly established BPBDs to quickly grasp the importance of preparedness as well as to enable the to use locational reference in developing their first ever disaster contingency plans..

In addition to using InaSAFE, the Program also supported several piloting of the use of village and school based risk assessment to help kick start the resilient village and safe school initiatives of the Government through the introduction of preparedness. Typical approach introduced through this pilot was to increase risk awareness and adoption of simple safety plans and procedures that suit the specific context of the local community.

4.3. Risk Reduction

Unlike risk identification and preparedness where the measures were considered as soft, risk reduction activities most of the time require hard measures. While some measures such as zoning can still be considered as soft, in practice its implementation requires hard investment such as resettlement, which involves housing and infrastructure construction and relocation.

As a Technical Assistance activity, the Mainstreaming DRR in Indonesia Program by its nature is not a hard investment project. However, being a mainstreaming activity, its risk reduction related activities cannot work separately from hard investment projects. Considering Indonesia's geography, the Program looks at the resilient at the community level as one of its priorities. This was done by designing a parallel component of mainstreaming DRR into Community Driven Development by adding an element of resilient in the PNPM Urban Program.[1]

The PNPM Urban Program is the Government platform that provides technical and funding support to communities at the urban ward to plan and implement projects carried out using community driven (based) approach. As a platform the PNPM Urban serves as a strategic entry point to provide small additional investment to mainstream resilience into local development program managed by the community. The Mainstreaming DRR in Indonesia Program provided technical expertise and facilitated institutional linkages between DRM and urban settlement infrastructure that allow the process of risk identification to be integrated into the community driven process, and inserted resilient measures in the menu of community projects in the PNPM Urban. Readers are advised to refer to the accompanying *Technical Note Number 3* for more detailed description of this initiative.

While the PNPM Urban is a Government program that was also partly financed by the World Bank, there are many other Government initiatives that are fully financed by state budget and also has nationwide scale. One such program is school construction and rehabilitation where the Government provided funding for the construction of new public school buildings and rehabilitation of the existing ones. The Mainstreaming DRR in Indonesia Program also built the experience of mainstreaming resilience in such public investment as school construction. By implementing pilot Technical Assistance to support Safe School initiative, the Program facilitated the mainstreaming of resilience in the Government classroom rehabilitation program between 2011 and 2012. This pilot, which covered 3 high risk provinces of West Sumatera, West Java and West Nusa Tenggara, was jointly implemented with GFDRR grant and Basic Education Capacity building Trust Fund (BEC-TF) grant from the European Union and the Netherlands Government. In PNPM Urban, the program invested in both technical assistance and facilitation as well as in providing to-up grant for community infrastructure and preparedness. But, in the Safe School pilot, around 180 schools that received government funding through the Special Allocation Fund (DAK) fiscal transfer for infrastructure rehabilitation, were provided only with technical assistance and facilitation from the Mainstreaming DRR Program and from the BEC-TF. This proofed that mainstreaming can also be successfully done through parallel funding, where investment costs were provided fully by the Government, providing greater sustainability for such investment. Readers are referred to Technical Note Number 4 for more detailed information about this initiative.

The experiences in mainstreaming resilience into major community driven development program like PNPM and the Government's school rehabilitation program have helped

1 The National Program for Community Empowerment (Program Nasional Pemberdayaan Masyarakat-PNPM) is a nation wide Government Community-Driven Development (CDD) that operates in all urban wards and rural villages of Indonesia. The World Bank supported the Government of Indonesia in developing its early version called the UPP and KDP back in nid-1990s, and subsequently co-financed the program until its completion in 2015.

built the confidence for the Mainstreaming DRR in Indonesia Program to look at the broader urban resilience challenges. As Indonesia is rapidly urbanizing, at the level of 4.1% between 2000 and 2010 alone, and at the same time decentralizing its development decision to the sub-national governments, making the growth of more than 98 cities taking a resilient path is a daunting task. Cities are at different level of development and have varying fiscal capacities to meet their development needs. In 2010, the Program started an engagement with the cities of Yogyakarta and Jakarta as part of the Climate Resilient Cities initiative to better understand the specific disaster and climate risks, needs and challenges. Several development partners were also working on the subject also in search for the proper model for engaging cities in building disaster and climate resilience. In 2012, the World Bank initiated a Building Urban Resilience in East Asia program which became the basis for the Mainstreaming DRR in Indonesia Program to work with 6 cities (Balikpapan, Denpasar, Makassar, Palembang, Semarang and Yogyakarta) through rapid risk diagnostic for building urban resilience in Indonesia. Risk profiles for the 6 cities were developed as tool to initiate conversations with the cities stakeholders on resilient urban investment. While the path toward actual city resilient investment is long, there has been significant progress made in developing framework to help cities assess their risks, and identify on-going and planned development investment where resilience could be integrated into projects and program. Readers are referred to Technical Note Number 5 on Urban Resilience Concept and Practices in Indonesia that captures the key framework and opportunities in mainstreaming resilience into urban development in the country.

4.4. Financial Protection and Risk Financing

Global experiences showed that even the most prepared country to face large scale disaster, namely Japan, cannot entirely reduce its risk to zero. There will remain residual risks even if risk identification, preparedness, and risk reduction investments have been fully mainstreamed into a country's development program. It is in anticipation of these residual risks that financial protection plays a critical role, in the same manner where the most careful driver of the best built car will still require accidental insurance to anticipate potential financial loss due to an unexpected traffic accident.

Financial protection and financing of disaster risks, however, is a large and more complicated space as the type of risks and assets to be covered are much varied compared to those in the case of vehicle insurance. Indonesia, however, being vulnerable to multiple hazards and perils, and are at the stage of investing heavily on public and private infrastructure are actually an "ideal" ground for introducing the concept of comprehensive risk financing strategy to complement its existing reliance only on Government reserve budget and on individual community savings to cushion its risk from disasters.

The Mainstreaming DRR in Indonesia Program initiated efforts to introduce this concept and to start policy discourse by undertaking an analysis and eventually published a report titled "Indonesia: Advancing a National Disaster Risk Financing Strategy – Options for Consideration". The report, which was prepared by a multi-disciplinary team of World Bank experts following a series of consultations with national stakeholders, highlighted the importance of: 1) improving the budgetary process for disaster contingent activities, and 2) diversifying the source of funding to finance such activities beyond the state budget reserve.

There are some important lessons emerging from the risk financing works of the program which may be useful for other countries with similar sets of complexity, economic and physical sizes, and variety of hazards as Indonesia:

1. The most frequent and damaging disasters (in the case of Indonesia is landslide and flash floods) may not always trigger conditions that justify contingent processes at the country wide level. This would mean that localized pooling system need to be developed cascading up to a national scale protection;
2. Contingent financing in the public sector is bound by the same accountability requirements as regular public spending, and special privileges (e.g., faster disbursement and more relaxed requirement) may lead to moral hazards and the proliferation of political economy around the contingent fund. A clear budgetary responsibilities among different levels of government, and allocation system that match the defined responsibilities need to be put in place;
3. While state budget may appear to be sufficient to cover any unexpected needs (especially when only referring to unspent budget at the end of fiscal year cycle), in practice multiple disaster occurrences may overwhelm the public sector financial management system, and that available public fund is best be allocated for financing development expenditures already planned as opposed to be kept as contingent fund. Utilizing risk transfer instruments such as insurance or catastrophic bonds may reduce uncertainty in the event of a 'disaster year', and help discipline the contingent budgetary system.

The Government of Indonesia had made significant progress, albeit still insufficient, in developing its Disaster Risk Financing Framework, notable achievement include:

a. Robust mechanism and accountability of the On-Call Fund (Dana Siap Pakai) which has proven to be effective in providing resources during a declared state of disaster emergency. In recent years the On Call fund has even expand its scope to support international relief efforts, and it is only limited (for a good purpose) by its availability only during the period of emergency;
b. A better defined contingent liability, where principally responsibility to rehabilitate assets damaged by the disaster rests within the owner of such assets. In the context of Indonesia's decentralized system, asset ownerships are divided as national, provincial, local and private and community's common properties. There has been clear policy and practice that the State provide

support (i.e., serves as insurer of the last resort), only when the asset owner is financially incapable of funding its own rehabilitation program;

c. A well-articulated framework on Contingent Fund (Dana Darurat) as stipulated in the Government Regulation 44/2012. While the Regulation was aimed at providing a clear legal basis for financing of National level disaster emergency and theoretically will be very rarely used, the principles, processes and procedures can be adopted in the regulation for smaller and more frequent disasters;

d. Multiple track efforts and initiatives in different ministries and units within the Ministry of Finance to think through policy options covering the subjects of: 1) fiscal protection against disaster, 2) insurance of public assets, 3) pooling of post disaster funding, and 4) promoting private and micro disaster risk insurance; and

e. Establishment of standing mechanism to coordinate and channel international assistance for post disaster funding through the Indonesia Disaster Fund (IDF), which has two trust fund windows managed by the United Nations and the World Bank, and the third window to accommodate direct/turn key assistance.

As Indonesia is still in the process of consolidating its decentralized fiscal policy, efforts to implement comprehensive Disaster Risk Financing and Insurance (DRFI) framework as proposed by the Mainstreaming DRR in Indonesia Program cannot be separated from the broader reform in the public sector financial management of the country. Continued improvement supported by regular analysis and policy dialogues and coordination will be required to built the momentum and gradually implement the comprehensive framework as building blocks. For more detailed information about lessons in DRFI development in Indonesia, readers are advised to refer to the accompanying Technical Note Number 6.

4.5.Resilient Recovery

The positive spin on Indonesia being highly vulnerable to and frequently experiencing disasters is that there are ample opportunities to use every disaster event as a learning process. The National Disaster Management Authority (BNPB) had in fact often use the term Indonesia as a living laboratory for Disaster Risk Management. In this regard, mainstreaming resilience into post disaster recovery and reconstruction becomes an important agenda.

The Mainstreaming DRR in Indonesia Program was in fact growing from the various post disaster reconstruction activities including Aceh and Nias tsunami, Yogyakarta and Central Java earthquake, West Java tsunami, West Sumatera earthquake, Mt Merapi eruption and various other smaller disasters that occurred between 2010 and to-date. Starting from mainstreaming Damage And Losses Assessment (DaLA) into the Government's recovery framework which was initiated during the Phase I of the Program, supports were deepen into institutionalizing and operationalizing the community-driven approach to housing and settlement rehabilitation and reconstruction, and integration of eco-settlement and livelihood into the recovery strategy and investment.

Among the notable achievement under this pillar is the support to the post 2010 Mt Merapi eruption reconstruction which saw one of the most innovative and well recognized settlement rehabilitation and reconstruction involving the development of new settlements consisting of more than 2,600 houses in 18 locations spread over 2 provinces, under the REKOMPAK Program. The REKOMPAK (Community Based Settlement Rehabilitation and Reconstruction Project-CSSRRP) itself was first established in support of Aceh and Nias tsunami as well as Yogyakarta earthquake recovery prior to BNPB's existence. In the context of Mt. Merapi recovery, the Mainstreaming DRR in Indonesia Program successfully linked a program which already existed pre BNPB, into a new partnership under the coordination of BNPB and combining funding resources from various donors (under Java Reconstruction Fund and PNPM Support Facility) with the Government's Rehabilitation and Reconstruction (RR) Fund under BNPB all under one coordinated management and implemented by the community with technical support of the Ministry of Public Works, provincial and local governments.

The success of REKOMPAK in Yogyakarta (especially Mt Merapi reconstruction) was often attributed to the strong social capital of the local community and the servant leadership of the provincial and local governments, in that is not easily replicable in other disaster-affected regions of Indonesia. This attribution was not entirely true as such social capitals also exist in other regions. In close collaboration with the Indonesia Disaster Fund (IDF), the Mainstreaming DRR in Indonesia Program helped transition the REKOMPAK from previously a geographically focused project into a national platform that is now mandated to operate in any disaster affected area of Indonesia.

The GFDRR Program support to mainstreaming resilience through REKOMPAK stretched beyond institutionalizing the program platform, to also include several innovative experiments in resilient eco-settlement, collaborative mapping for hazard zoning, and community livelihood. For more detailed information about lessons in resilient settlement recovery, readers are advised to refer to the accompanying Report Number 1.

5.0. Achievements, Lessons and Remaining Challenges

Achievements

As a programmatic approach, the Mainstreaming DRR in Indonesia Program had contributed to the efforts of developing a working model to leverage the World Bank Country Partnership Strategy and investment program in Indonesia to integrate resilience into the portfolio. The GFDRR 6-pillar approach provides a guidance to strengthen the critical element of a country's resilience to disaster and climate risks. In the context of Indonesia, several achievement of the country in mainstreaming resilience can be attributed to the contribution of this program. Within the 6 pillars, these achievement include:

a. Risk Identification: the practice of including risk maps in DM Plan and IRBI was initiated by the Program's support to the first risk mapping as part of NAP DRR 2010-2012

Box 1. Resilience is mainstreamed in the Medium Term Development Plan- RPJMN 2015-2019

The National Medium Term Development Plan (RPJMN) for 2015-2019 is very encouraging from the Disaster Risk Management perspective. A simple count of the keyword "disaster" resulted in the words mentioned 68 times throughout the 7-chapter planning document. Conservation of natural resources and environment and disaster management is section within the pillar of "Building economic independence through mobilization of domestic economic sectors". While the overall pillar is about building greater reliance on national capacity, the fact that disaster management is part of an economic agenda is a welcome departure from previous planning document that put disaster in the general category of externalities that need to be managed.

Building disaster resilience is also found in the chapters that outline development agenda on infrastructure, urban development including through disaster proofing and green and resilient development. The Government also recognized the importance of disaster risk management in decision-making by targeting to establish situation room at the President office to prevent, manage and respond to potential crisis from disasters and social conflict.

Under the specific sub-chapter on management and reduction of disaster risks, there are 3 strategic directions including: 1) Internalizing disaster risk reduction in the national and sub-national development framework, 2) reducing vulnerability to disasters, and 3) strengthening the capacity of the Government sub-national governments and community in disaster risk reduction. The RPJM also highlighted the importance in strengthening risk information and early warning for disaster and climate risks, as well as utilizing planning instrument such as spatial risk zoning and development control to prevention the creation of new risks from new development.

b. Preparedness: making preparedness a concrete undertaking by using InaSAFE has helped the newly established BPBDs to gain leverage as a new institution among its much better established peers

c. Risk Reduction: mainstreaming DRR into PNPM urban build strong foundation and platform to operationalize resilient investment into urban development – in inside Slum Upgrading

d. Financial Protection: while Indonesia still falls short from adopting country wide risk transfer mechanism, it already has the different element of the comprehensive risk financing puzzle in place

e. Resilient Recovery: community based housing rehabilitation and reconstruction has become an icon for Indonesia's resilient recovery agenda, despite continued challenges – this is a reflection that Indonesia is large and complex.

Lessons

There are several key lessons that can be drawn from the implementation of the Mainstreaming DRR in Indonesia Program that could be useful for further efforts domestically or in other countries, as well as of mainstreaming other subject into a country's development. Few notable lessons include:

a. That the main enemy of mainstreaming DRM/resilience effort is actually a specific project in DRM itself. While there are some subject such as risk financing or flood control that are clear cut disaster risk management project, most mainstreaming efforts will have to be done by sectors and projects, and not by the DRM agency or team.

b. Mainstreaming is about supporting others who undertake investment through advocacy and technical support in thinking about risk and managing the risk. Tools such as risk maps, risk profiles, resilient design are among the examples where supports are usually needed by program and project owner to consider and incorporate.

c. Resilience is a condition that benefit and should credit everyone. Most programs or projects are sectoral in nature and are linked to specific performance indicator and budget accountability. Achieving resiliency is not usually at the forefront of these indicators. But it is important to built within a program and project a sense and measures that can inform sectoral managers if their program or projects are disaster and climate risk proof.

d. Finally, making investment resilience is about finding the additionality to respond to specific risk. Therefore, investing in resilience has to start from including risk management in the planning and design, although in some cases a retrofitting or upgrading approach could be used.

Remaining Challenges

While the inclusion of resilience in the national development agenda of the next 5 years is a welcome step, implementation will require systematic, consistent and more importantly realistic target. Schematic diagram of the Government of Indonesia's resilience goal and program pillars is presented in the diagram in Figure 2.

Figure 2. Schematic diagram of resilience goal and program pillar (source: Bappenas 2015)

With a goal of reducing disaster risk index in 120 districts and 16 cities considered as targeted for rapid development investment, there are clear opportunity where investments are being made and resilience can be mainstreamed. However, the seven program pillars starting from policy strengthening to thematic interventions in disaster prone areas to development of recovery system, requires close coordination between sectoral ministry, sub-national governments and other development actors undertaking the investment to ensure that resilient measures (e.g., improved design standard) are built-in from the beginning. The initial focus on 8 hazards, from earthquake to forest fires, also poses a challenge as different technical approaches are needed for different combination of hazards.

Experience from the Mainstreaming DRR in Indonesia Program, however, suggest that such an ambitious agenda is achievable so long as realistic targets are set, key stakeholders in the investment are identified, continued support is provided, and concrete measures are well coordinated. The Safe School and Urban DRM-CDD experiences as outlined in this report provide evidence that such systematic processes can be carried out and that Indonesia is ready to gradually scale up it mainstreaming investment.

As Indonesia is a large archipelagic territory with multiple hazards and decentralized governance and public service delivery system, building such a massive institutional infrastructure will require non-conventional approach. Considering itself as a living laboratory for Disaster Risk Management, the National Disaster Management Authority (BNPB) has adopted a knowledge management approach in building and sustaining local capacity to manage disaster risks. The knowledge management approach is aimed at ensuring that every experience and lesson from a handling and managing of a disaster event will strengthen the country's capacity in managing the next events. With the support of the Leadership, Learning, and Innovation (LLI) of the World Bank, the Mainstreaming of DRR in Indonesia Program has supported the BNPB in internalizing the DRM Knowledge Sharing culture and capacity. Readers are advised to refer to the accompanying Technical Note Number 8 for more detailed information on the DRM Knowledge Management works with the BNPB.

Technical Note 1

RISK INFORMATION FOR MANAGING URBAN FLOOD IN JAKARTA

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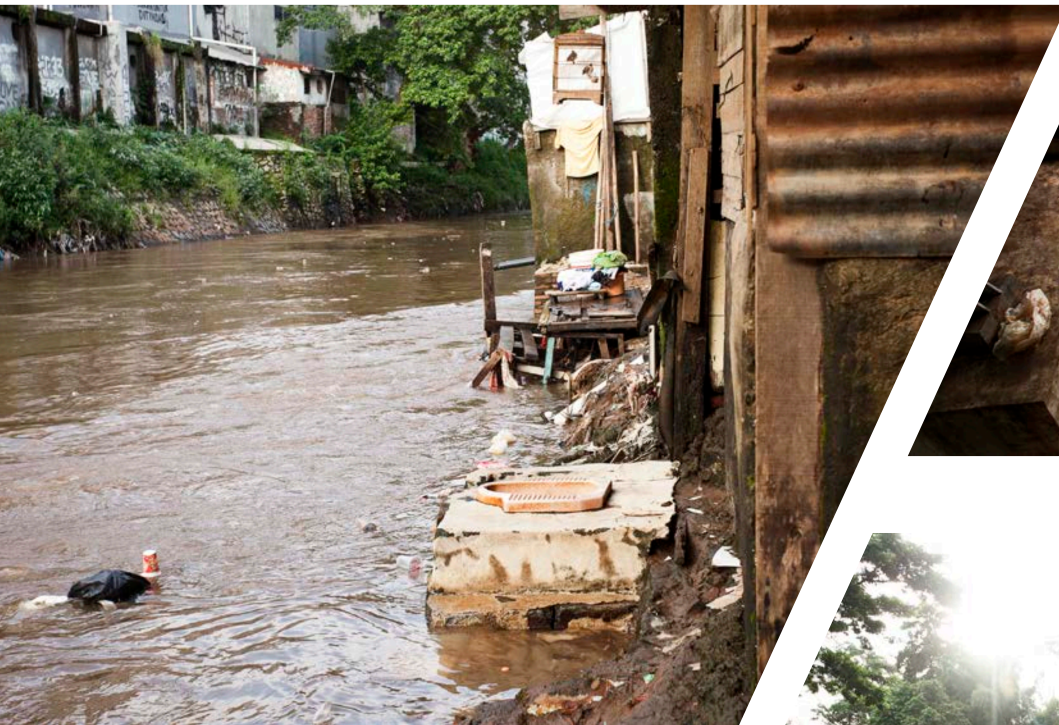

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Contents

ACRONYMS & ABBREVIATIONS

AIFDR	Australia Indonesia Facility for Disaster Reduction
API	Application Programming Interface
BIG	Badan Informasi Geospatial (Geospatial Information Agency)
BPBD	Badan Penanggulangan Bencana Daerah
DIMS	Disaster Information Management System
DKI	Daerah Khusus Ibukota (Capital Special Region)
GFDRR	Global Facility for Disaster Reduction and Recovery
HOT	Humanitarian OpenStreetMap Team
OSM	OpenStreetMap
SKPD	Satuan Kerja Perangkat Dinas (Government Working Unit)
UN OCHA	United Nations Office for the Coordination of Humanitarian Affairs

FIGURE

I. FLOOD RISK IN JAKARTA

I.1. CITY PROFILE

Jakarta, the capital city of one of the world's fastest growing economy, holds a very strategic role as the country's political and economic center. The President, Parliament and lines of government Ministries offices are all located in Jakarta, as well as the embassies' offices, a number of large international and regional bodies, and a large number of civil society organizations, which make Jakarta such a strategic place for the Indonesian policy making and public affairs. On top of this, Jakarta also houses important financial institutions such as the Indonesia stock exchange and the Bank of Indonesia, as well as the corporate headquarters to a large number of Indonesian companies and multinational corporations, which makes it also hold a very strategic role for the country's economy.

The total size of Jakarta city area is 661.5km2 and is divided to five administrative cities of South Jakarta, Central Jakarta, East Jakarta, West Jakarta, and North Jakarta, and one administrative district, the Thousand Island, a collection of small 105 islands located to the north of Jakarta. Jakarta total population is 10 million within the city, while the total population of the entire metro area is 30 million. The total metropolitan area is known as Jabodetabek, which stands for the Jakarta, Bogor, Depok, Tangerang and Bekasi. 60 per cent of the economic activities occurs in Jakarta, which draws millions of people from the surrounding satellite cities to commute to Jakarta on daily basis.

Figure 1: City Landscape (World Bank: 2015)

Jakarta needs strong infrastructure to facilitate its roles as center of government and economic, as well as to accommodate the needs of its own population towards public facilities, transportation, utilities network, and so on.

I.2. FACTORS CONTRIBUTING TO JAKARTA'S VULNERABILITY TO FLOODS

The underlying factors of Jakarta's vulnerability to floods are linked to geographical conditions, infrastructures, environmental damage and low awareness of its population to care for the environment.

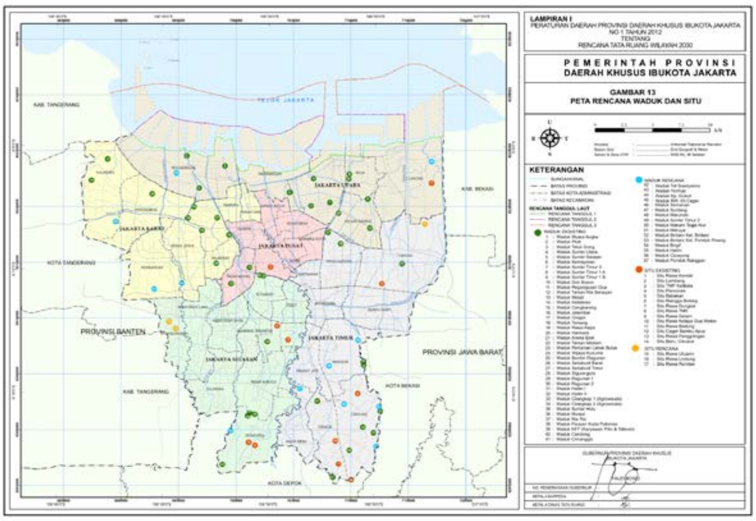


FIGURE 2: JAKARTA RIVER NETWORK AND RESERVOIR DEVELOPMENT PLAN (BAPPEDA DKI, 2012)

Jakarta has 13 rivers that pass through the city and end in Jakarta Bay. Any environmental damage and deforestation around the river banks in Jakarta and Bogor, the satellite city where the upper-rivers are located, will lead to overflowing of rivers. On top of this, Jakarta also has insufficient drainage system, which is worsened by poor waste management practice and the community's low awareness in terms of waste management leading to a large quantity of garbage that ends in the rivers. Moreover, like any other metropolitan area in fast-growing-economic countries, it also faces tremendous challenge to protect the environment due to increase pressure from settlement, and major decline of catchment area in and around Jakarta due to environmental damage around the riverbanks and deforestation. Most of the major floods in Jakarta, including the one in 2007, were in-land flood due to overflowing of Ciliwung and Cisadane rivers from heavy rainfall in the upper stream in Bogor city that overtopped the downstream in Jakarta.

On top of this, around 40% (24,000 ha) of Jakarta area is lower than the sea surface due to pressure from infrastructures and over-exploitation of groundwater. This leads to coastal flooding or intrusion of sea water, which is due to the topography of the land exposed to flooding, especially in North Jakarta area (BPBD Provinsi DKI Jakarta, 2012).

I.3. HISTORY OF FLOOD OCCURRENCE

Flood issue in Jakarta has been recognized since the city was first developed by the Dutch Colony government in the 1619. During that period, the Dutch government had designed network of canals to reduce the risk of flood. Nevertheless, the worst flood recorded in history still occurred during colonial period in 1621, 1654, 1976, and 1918 as described by the following figure.

1699
Flood around Ciliwung river in old Batavia soon after the eruption of Salak volcano

1714
Overflowing of Ciliwung River due to deforestation of forest area in Puncak

1854
The New Batavia fell to one meter below sea surface due to the overflowing of Ciliwung River

1918
Flood continued to occur. The Dutch Colony government started the construction of West Banjir Canal

1942
Flood still occurred in Jakarta despite of the completion of West Banjir Canal

1996
Flood inundated the capital city. 10 people died.

2002
Noted as the largest flood in the history of Jakarta, 25 people died.

2007
The largest flood in Jakarta in the last three decades.

2013
Flood in Jakarta spread to larger area.

FIGURE 3: HISTORICAL RECORDS OF FLOOD INCIDENT IN JAKARTA (BPBD DKI JAKARTA, 2013)

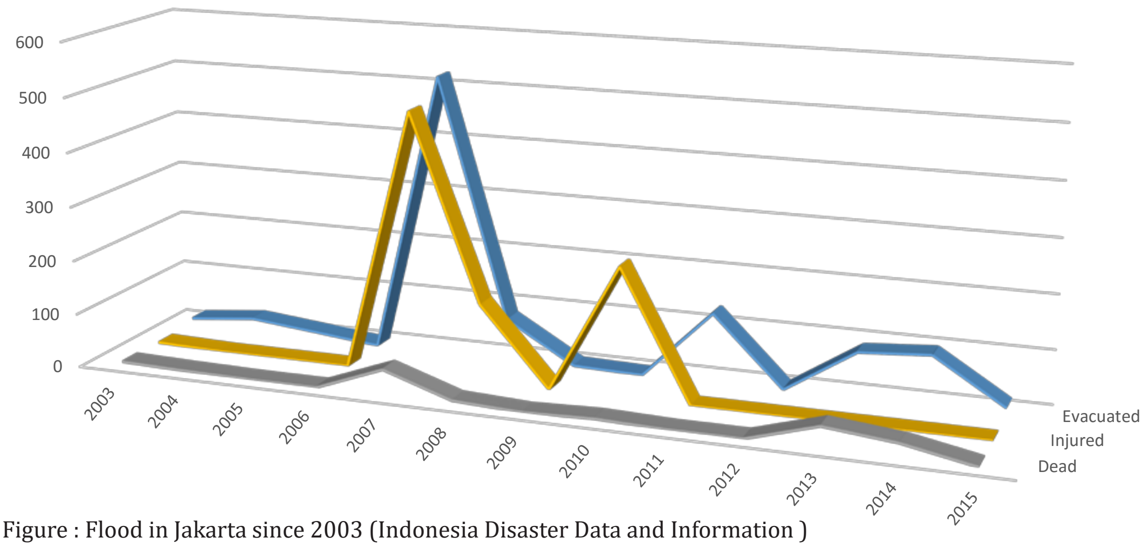


Figure : Flood in Jakarta since 2003 (Indonesia Disaster Data and Information)

In the more recent years, floods occur every year in some areas in Jakarta since 2002. Some years are worse than the others. The floods which occurred in 2007 and 2013 received the greatest attention as they inundated almost the entire city area.

The following map shows the spread of inundated area during the worst floods incident in Jakarta in 2007 and 2013.

Figure ... presents the comparison of inundated area in 2007 and 2013, which shows expansion especially in the northern area of Jakarta.

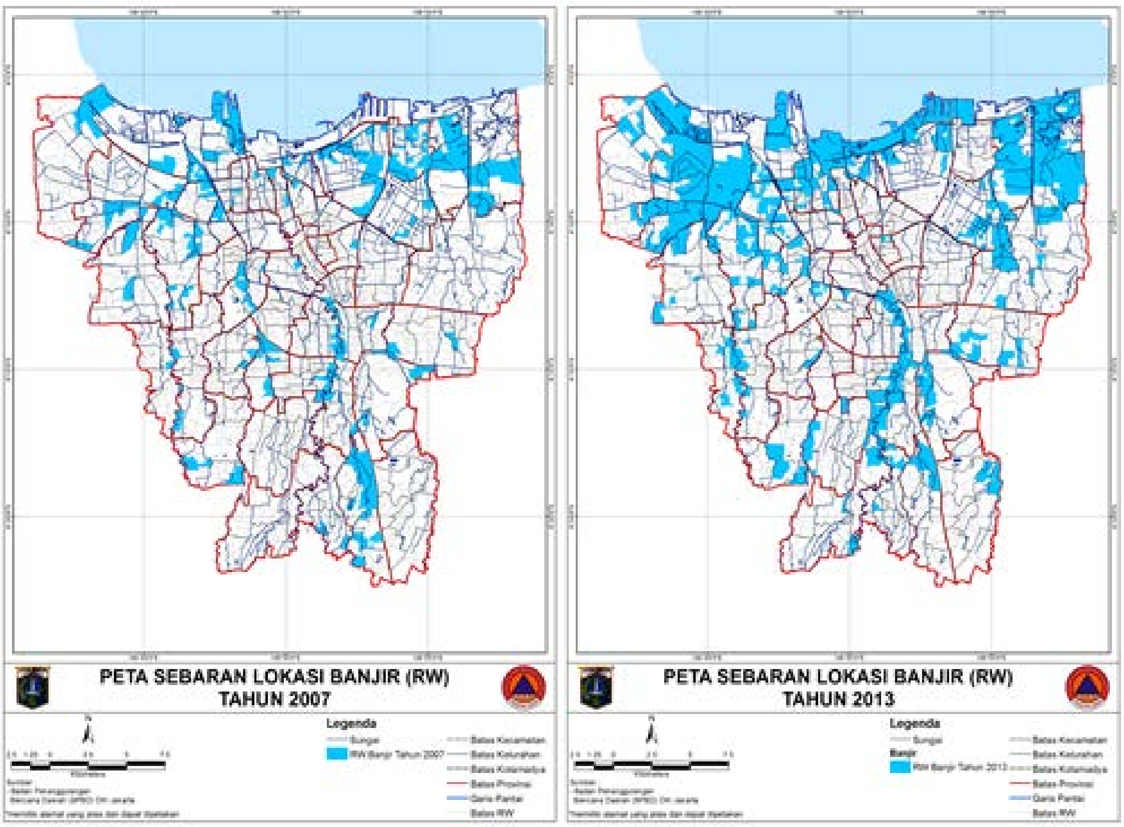


Figure 5: Comparison Of Flood In 2007 And 2013 (Source: Bpbd DKI Jakarta)

I.4. FLOOD IMPACT

Once a flood occurred, it immediately paralyzed the entire city and this situation could last for several days. In Jakarta, the impact is significant due to the number of population and infrastructures. A flood forces business, government offices, and health and education facilities to shut down entirely, while people were busy coping with the flood. In February 2007, floods have cost the country IDR 5.16 trillion (BPBD Provinsi DKI Jakarta, 2012). Furthermore, the following table shows the damage and loss that Jakarta had to suffer due to the flood in 2013.

Based on the table, the cost of Jakarta flood in 2013 for private sector was 6.3 trillion rupiahs, while for the government it cost them 1.2 trillion rupiahs, which means that it cost private sector more than five times compared to the government. Private's financial sector suffered the most lost with 3.1 trillion rupiahs, followed by private trade sector with 2.3 trillion rupiahs. The huge impact of flood requires the city to better prepare and reduce the risk in the future.

Sector	Damage	Loss	Total	Owned by	
				Government	Private
Productive Sector	310,000	3,279,000	3,590,000	530,000	3,059,000
Agriculture	35	100	135	0	135
Trade	200,000	2,628,000	2,828,000	527,000	2,301,000
Industry	92,000	613,000	706,000	0	706,000
Tourism	18,000	37,000	56,000	3,000	52,000
Social and housing	153,000	150,000	303,000	267,000	36,000
Housing	62,000	62,000	124,000	0	124,000
Health	39,000	85,000	124,000	117,000	8,000
Education	51,000	3,000	54,000	26,000	29,000
Infrastructure	224,000	221,000	445,000	328,000	116,000
Transportation	102,000	101,000	203,000	94,000	109,000
Telecommunication	230	1,000	2,000	0	2,000
Energy	116,000	100,000	216,000	216,000	0
Clean water & sanitation	6,000	17,000	23,000	18,000	5,000
Cross Sector	140,000	3,112,000	3,252,000	96,000	3,156,000
Government	92,000	9,000	101,000	101,000	0
Finance	0	3,110,000	3,110,000	0	3,110,000
Religion	6,000	3,000	8,000	0	8,000
Environment	2,000	1,000	3,000	3,000	0
Total	828,000	6,762,000	7,590,000	1,222,000	6,368,000

Figure 6 : Damage and Loss from Flood in Jakarta in 2013 in million rupiah (BPBD DKI Jakarta, 2013)

II. INFORMATION GAPS IN MANAGING URBAN FLOOD

II.1. POLICY FRAMEWORK

Disaster management is a newly developed paradigm across policy makers in Indonesia. Indonesia first developed Law on Disaster Management (Law number 24 of 2007) in 2007 amidst the pressure from a series of massive natural disasters including the Boxing Day Tsunami in 2004 and the earthquake in Jogjakarta and Central Java in 2006. Prior to Law 24/2007, disaster management was organized on ad-hoc basis following a natural disaster. In 2004, however, the Boxing Day Tsunami had cost significant damages and casualties occurred, followed by overwhelming flow of humanitarian aid, both of which had created tremendous pressures from the affected population, civil society organizations and international humanitarian community to the Government of Indonesia to create a better system and organization of post-disaster response, recovery and rehabilitation.

Jakarta flood management, which impact is limited to Jakarta Province, also used to be managed in ad-hoc manner by the local government, in which the Governor used his authority to mobilize emergency supports such as the military and Search-and-Rescue team, and in more recent years the Disaster Management Coordination Body (BAKORNAS PB). The Jakarta Governor's Regulation 26/2011 concerning the Local Disaster Management Agency (BPBD DKI Jakarta) was issued to ensure the implementation of the Law 24/2007 at local level. The Governor's Regulation 26/2011 provides that the DKI Jakarta Province Secretary holds the position of ex-officio Head of BPBD (Article 3), while the Agency bears mandates such as establishing guidelines and taking leadership in disaster management efforts before, during and post-disaster (Article 4).

Assuming strong leadership in disaster management, as mandated, has always been a difficult task for BPBD DKI Jakarta, as a new institution, it continues to struggle with numerous challenges related to institutional building. The disaster management agency continues to struggle to find a solid role and standing position within a larger policy context and among other government working units. In the case of BPBD, the arrangement with having the Province Secretary holding the mandate of leading BPBD DKI Jakarta has its up and down sides. The good thing is it provides the BPBD DKI Jakarta with a much needed strong leadership and authority to lead other SKPDs during emergency response. Having the Province Secretary leading BPBD DKI also helps ensuring that each SKPD implement their part of the task in reducing disaster risk. However, there is not much clarity whether such leadership is performed by the Province Secretary as part of his/her job as the Province Secretary or if it is conducted through BPBD as the Head of BPBD, which could provide the opportunity to strengthen BPBD role and legitimacy.

Moreover, such arrangement with having an ex-officio leader also provides little incentive for the Province Secretary to assume stronger role as the Head of BPBD with interest to enforce other SKPD to support BPBD and to ensure that BPBD earns its much needed legitimacy to coordinate and take leadership in disaster management efforts as expected in the legislation that establishes it. As a result, disaster management continues to be addressed in ad-hoc basis by a single institution led by the Province Secretary, who advises the Governor, instead of having SKPDs chipped-in into disaster management efforts coordinated by BPBD DKI Jakarta.

2.2 INFORMATION MANAGEMENT IN FLOODS

Information management is the backbone of disaster management. It tells us areas that are at risk, the circumstances of emergency situation, the size of impact, priority areas for recovery and so on. It is urgent to get accurate and timely information before, during and after a disaster (Putra, 2014). Each disaster phase requires different kinds of information that would eventually lead to a better planning, response and recovery. The diverse nature of information also means that it will be managed by multiple agencies which may not directly relate to the needs of disaster management. Moreover, there are multiple data policies and formats. The main challenge, thus, lies on how to collect, store and manage the data under data management perspectives.

Below are examples of the different kinds of information required for flood management according to disaster management cycle:

Preparedness	Emergency Response	Recovery
Flood prone areas Flood-related infrastructures Watergate location River network Land Use	Flood depth Affected areas Casualties Logistic needs Road access Evacuation camp	Damage and Loss List of beneficiaries

Figure 7: Flood Information in different phases of disaster

There are multiple challenges on managing this breadth of information that would include technical and non-technical challenges such as data format, accuracy, human resources, and policy.

A robust information system is the core of a disaster management agency, including the one in BPBD DKI Jakarta. The information system is particularly necessary for the decision maker to make better decisions. There are two big challenges that they often have; how to collect the data and how to turn them into useful information. These data are normally located at different offices, using different formats and need higher authorization to retrieve them. Thus, it would require a considerable amount of time to collect them. Another potential source of data comes from mass media and social media channel, yet it still requires additional steps to validate and verify the accuracy of the information.

The second big challenge faced by Jakarta is the availability of manpower to manage the information. The effort to recruit skilled information management person often constrained by the availability of the budget and the lengthy time required for the whole process of civil servant's recruitment.

III.1. STRENGTHENING RISK INFORMATION

III.1. INASAFE – A TOOL TO UNDERSTAND THE IMPACT OF FLOOD

The absence of technology to assist a disaster manager to understand the impact of a disaster and how to prepare to respond drives to the development of InaSAFE- a software that produces realistic natural hazard impact scenarios . InaSAFE was developed jointly by Indonesia (BNPB), Australia (Australian Government) and the World Bank (GFDRR). Version 1 was launched in 2012 and has rolled out ever since. It has been trialed and used to develop scenarios in some areas in Indonesia.

In Jakarta, the tool has been tested based on the 2007 flood scenario. To effectively prepare for floods, a disaster manager must first understand the likely impacts that need to be managed. For example, to prepare contingency plans for a severe flood in Jakarta, emergency managers need to answer questions like: what are the areas likely to be affected; how many people will need to be evacuated and sheltered; which schools will be closed; which hospitals can still take patients; and, what roads will be closed. The software is focused on examining, in detail, the impacts a single hazard would have on specific sectors. InaSAFE is designed to use and combine existing data from science agencies, local governments, and communities (www.inasafe.org).

The use of InaSAFE in Jakarta was hold by BPBD DKI Jakarta. During the exercise, there was a challenge in the availability of spatial data. The issue was around the basis of assumption which was derived from administrative units in Jakarta . While, at the time InaSAFE was trialed, Jakarta had only boundaries information up to kelurahan (village) levels. This had led to over estimating impacts of flood resulted in InaSAFE. The need of more detailed information on boundaries and assets was responded through the use of external tools such as OpenStreetMap. This initiative was followed up by a series of activity to support the improvement of spatial data accuracy, exposure and flood reporting system.

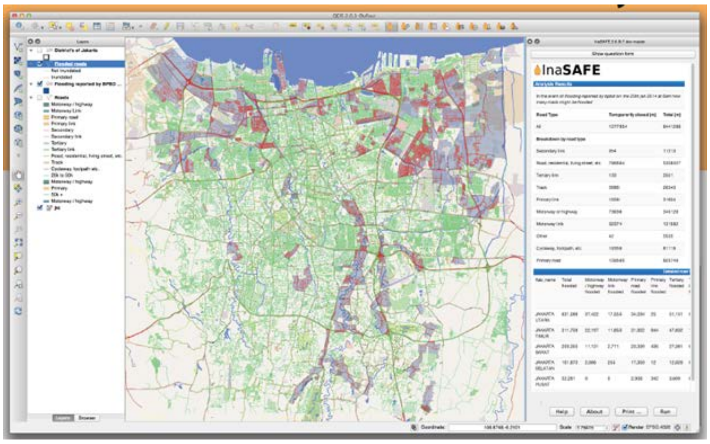


Figure .... : InaSAFE exercise based on the 2007 Jakarta flood scenario

III.2. IMPROVING SPATIAL DATA ACCURACY: ADMINISTRATIVE BOUNDARIES & EXPOSURE

Although Indonesia government hierarchy has already been well established based on administrative units, there are still challenges in visualizing the information. Jakarta provincial government and the National Mapping Agency (BIG) use village maps as their most detailed administrative boundary visualization. This would result in difficulties in depicting accurate representation of what really happens on the ground.

Based on BPBD DKI Jakarta experience, the reports from village heads can provide information regarding the affected areas in detail, including the flood depth down to the smallest administrative unit (RT), but the visualization is only available down to village unit (two levels above RT). This would result in overestimation of the actual condition of flood impact when the report is presented in a map because the whole village will be displayed as affected.

Based on the challenges above, in March 2012, BPBD DKI Jakarta in collaboration with BNPB, Australia Indonesia Facility for Disaster Reduction, United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA), Global Facility for Disaster Reduction and Recovery (GFDRR), World Bank, Humanitarian OpenStreetMap Team (HOT), and

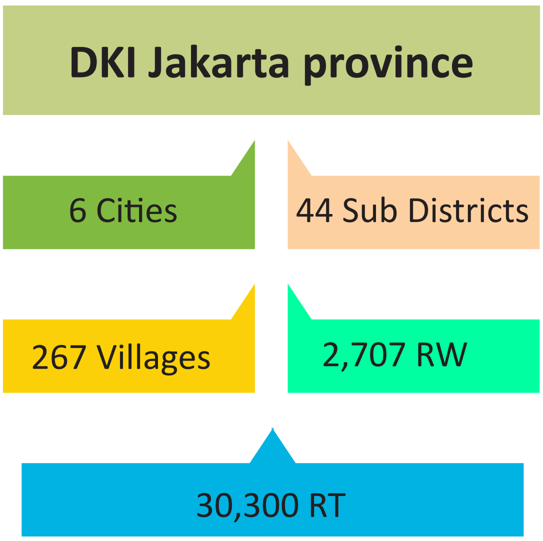


Figure 8: The Hierarchy Of Administrative Unit In Jakarta (Statistics Of Dki Jakarta Provinces, 2012)

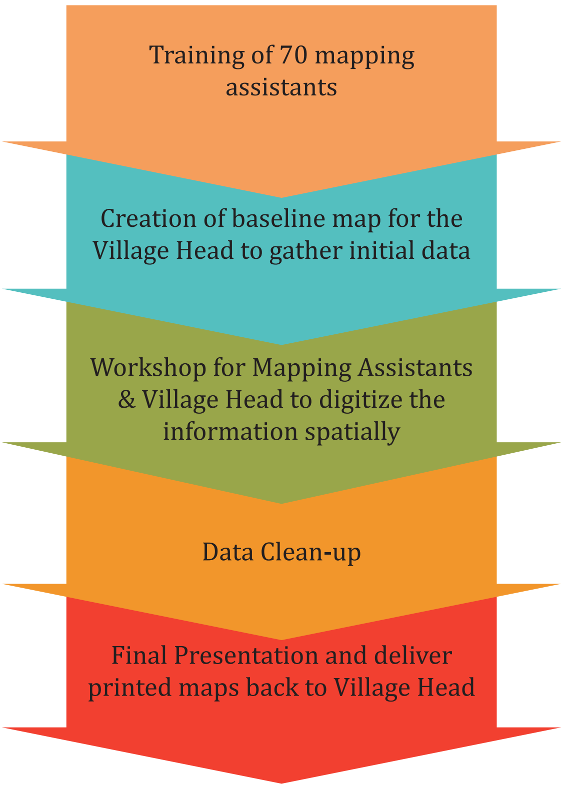


Figure 9: Jakarta 2012 Rw Mapping Series Of Events (Chapman, 2012)

University of Indonesia (UI) pioneered an effort to map all of the RW (sub-village) boundaries, critical infrastructures and assets in 267 villages in DKI Jakarta province.

The above activities (Figure 5: Jakarta 2012 RW Mapping Series of Events (Chapman, 2012)) were conducted in March-April 2012. It was a successful event, where more than 500 representatives of Jakarta's 267 villages participated in the workshop and managed to map around 6,000 buildings and 2,688 RW boundaries (Chapman, 2012). All of these data are inputted in OpenStreetMap (OSM), a free and open mapping platform. This choice of platform enables future updates of the data by the community as well as wider utilization of the data in sectors beyond disaster management.

There are multiple ways on how these data can be used in disaster management. Oneexample is how the data is used to develop a detailed scenario on estimation of future flood impact. The scenario will assist government and other stakeholders to make a better plan anticipating the impact of future disasters.

The quest to produce more detailed data, in this case RT level, continued in 2014-2015 through a series of event namely Jakarta RT Mapping. The event was led by BPBD DKI Jakarta with the support from AIFDR, HOT and The World Bank. 35 flood prone villages in Jakarta were selected to be mapped down to RT level. This project attempted to map RT boundaries (sub-sub village), roads, and critical infrastructures. RT level mapping has also made capturing proposed evacuation route and evacuation camp that will be used during emergencies becomes doable. Additional data such as local structural risks and historical flood event in every RT were also captured.

Figure 10: Collaborative Data Input In 2012 Jakarta Rw Mapping (OSM Indonesia)

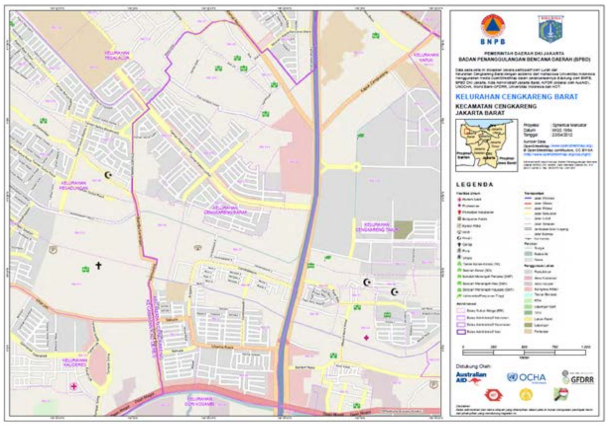


Figure 11: Example Of Village Map From Jakarta Rw Mapping, Rw Boundaries Are Displayed In Dashed Purple Line

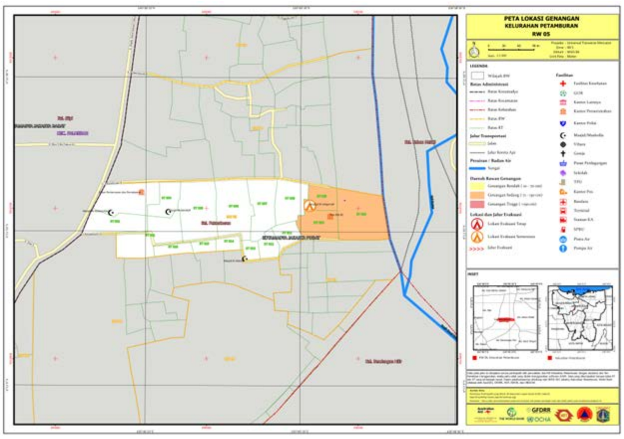


Figure 12: Historical Inundation Map In One Of Rw At Petamburan Village

More detailed data enable more in-depth analysis of flood occurrences and better preparedness for future flooding.

Based on the result from Jakarta RT Mapping, there are attempts to replicate the RT-level detail into all of the villages in Jakarta through government's own budget. Even when all RTs in Jakarta have been mapped, the job is never finished, due to the nature of the dynamic urban environment.

Figure 8 shows the example of one of the results from RT Mapping. RT boundaries are represented by green dotted line. It also shows location of temporary evacuation centers and public facilities, such as health facilities, government offices, and religious facilities in the area. Using this information, potential flood risk can be more accurately identified and stakeholders can give resource priority to the area with high risk.

III.3. DEVELOPING AUTOMATIC DAMAGE AND LOSS ASSESSMENT CALCULATOR

To get the damage and loss assessment (DaLA) of a certain disaster, such as Jakarta flood, government needs to do manual calculation and valuation of the flood impact. In 2013, BPBD led the activity of DaLA estimation for Jakarta flood with support from the World Bank. It took months to result the estimation. The reason was similar to what have been described in chapter 2, where the data were scattered across different agencies in the government. The quality of data was also poor as they did not represent the whole profile of assets but only partially recorded. In 2014, BPBD DKI Jakarta tried to work on the cost estimation based on previous RW mapping data as well as data from other agencies.

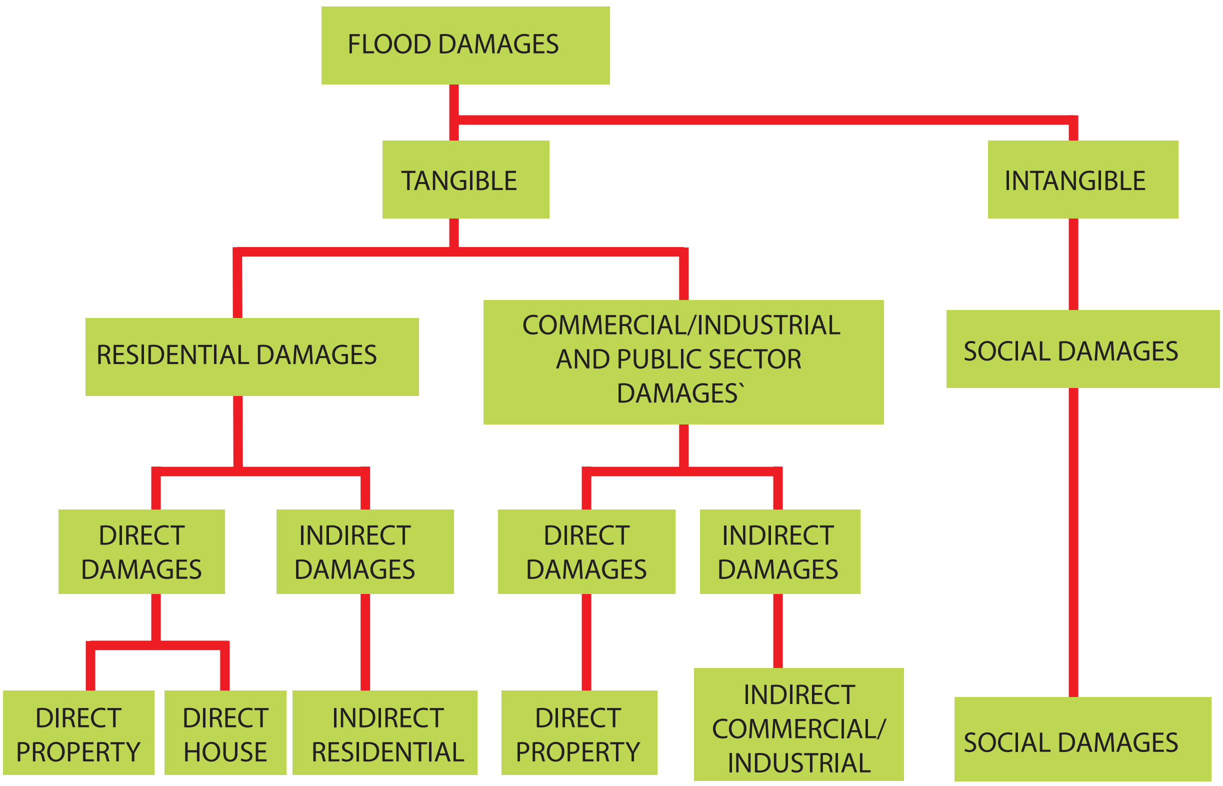


Figure 13: Flood Damages Components (Inteligensi Risiko, 2015)

The plan to develop automatic DaLA calculator becomes possible by using InaSAFE software. The new software, called JakSAFE is augmenting InaSAFE with the ability to produce DaLA estimation from Jakarta flood based on the flood report data from BPBD DKI Jakarta's information system and OpenStreetMap platform. In the development it has successfully solved several technical challenges on data format and improved performance for complex calculations while maintaining ease of use.

JakSAFE is a system designed to estimate the damage and loss due to a flood event in DKI Jakarta. JakSAFE estimates financial damage and losses due to flood generated from estimation of a reported flood event via BPBD team, people's report, social media, and confirmed by field surveyors. The report is then aggregated by RW's of Villages and attached to certain height of inundated and flood long (in days).

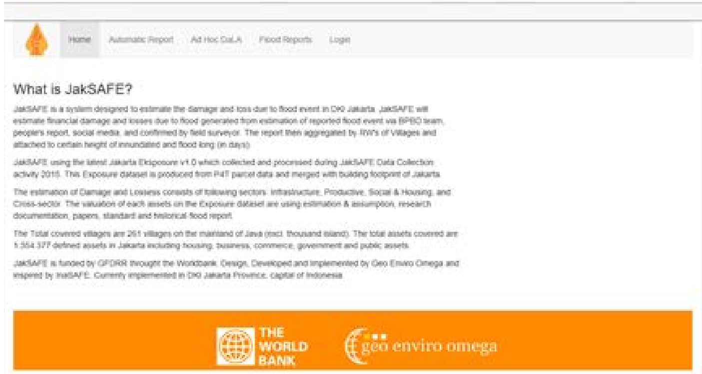


Figure 14 : JakSAFE application on web (http://jaksafe.bpbd.jakarta.go.id/)

JakSAFE logic is developed from overlaying hazard information with exposed assets. In late 2015, the JakSAFE prototype was launched and can provide rapid DaLA in a given time period of flood. The platform was also integrated into Jakarta Smart City platform to provide information on damage and loss due to floods. The availability of detailed administrative boundaries information of Jakarta has enabled a more accurate and realistic estimation. The activities produced Jakarta exposure

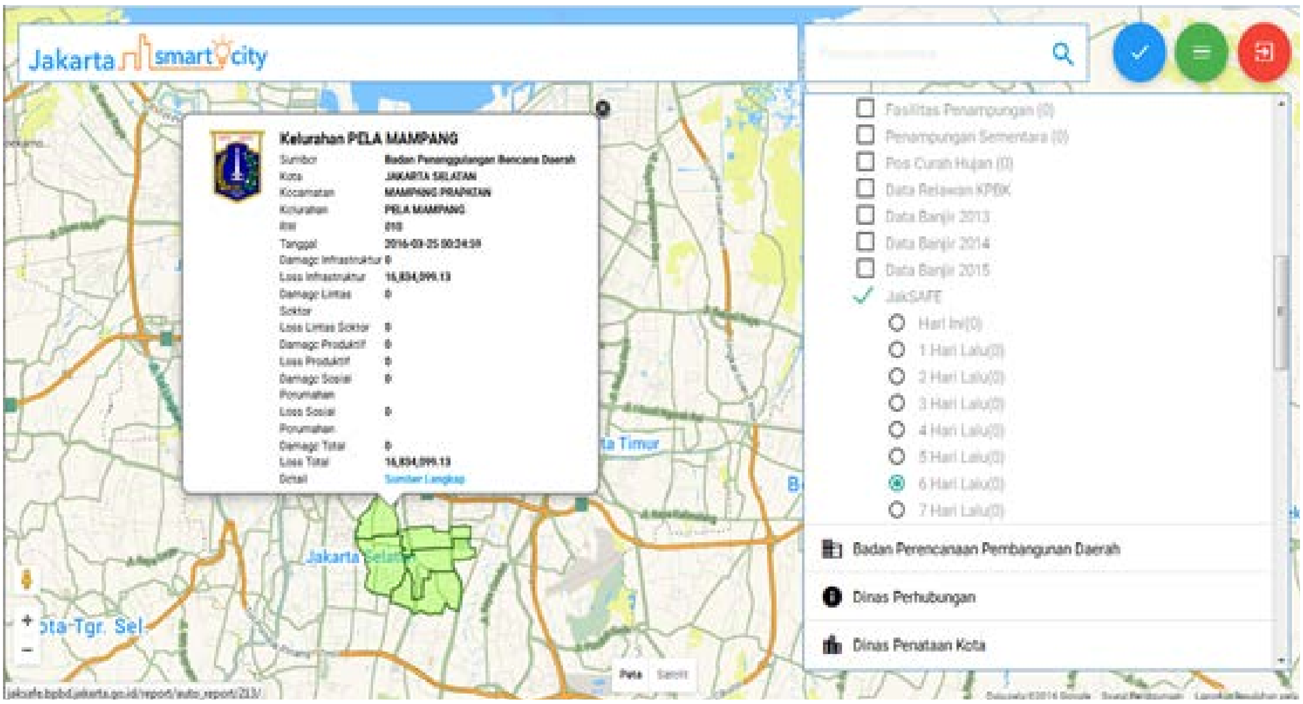


Figure 15: Jaksafe Integration Into Jakarta Smart City Platform (Pt. Geo Enviro Omega, 2015)

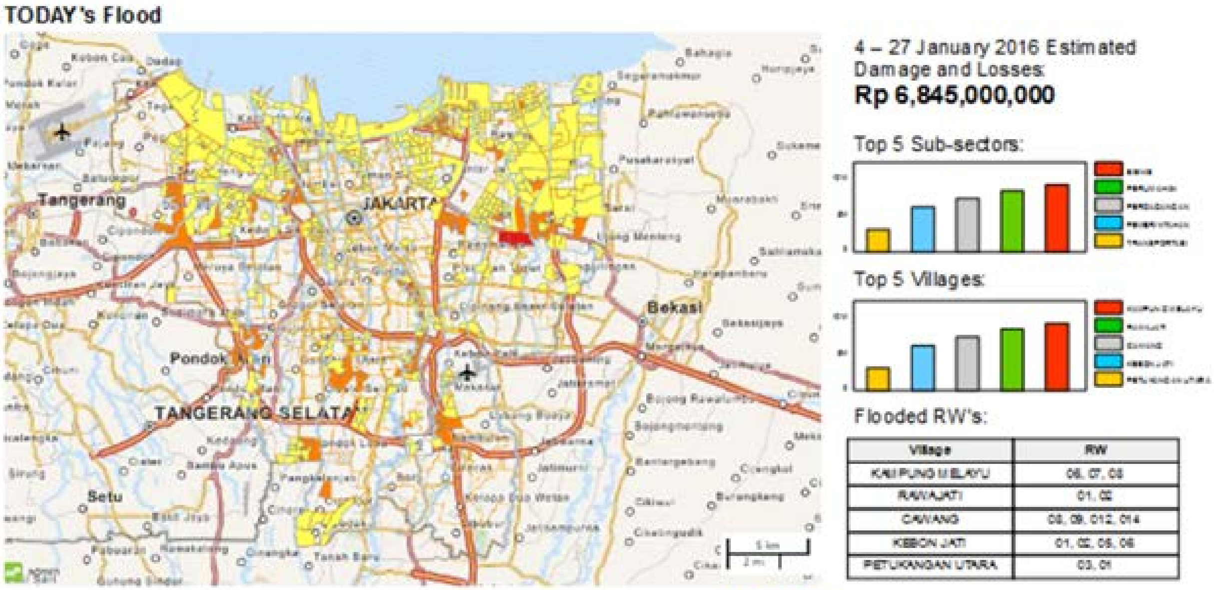


Figure 16 : User Interface Of Jaksafe In Opendims

information- a dataset consisting of land parcels and building footprints gathered and processed from the City Land Administration Agency (Dinas Penataan Kota).

The development of JakSAFE passed throughout a few phases. The first version of JakSAFE has been improved to get more accurate estimation. In version 1.1, JakSAFE follows the administrative boundaries to figure out the inundation area. For example, if there is a report of flood in RW 05, the existing system will consider the whole area in RW 05 flooded. Therefore, JakSAFE will mark that all the assets in the RW 05 to be considered as affected. Then it will have the value of Damage and Loss. Suspected flooding area is detailing further in the latest version. The method of determining suspected polygon flood area is done by contour localization method or using hydrodynamic models.

Sample result of estimation has been compared with the real information gathered from field survey data. The DaLA result has also verified with the real events and real damage and losses value. Therefore, the field survey is conducted in order to collect the information of assets that are exposed by the flood, value of damages and losses and distribution of flood points.

The existing JakSAFE needs supply of information produced by another system called DIMS. DIMS publishes the API that can be consumed by another system. The challenge is on the quality of the existing API as it is not consistent with the raw data. The existing DIMS is a closed-source software that cannot be easily enhanced. The main function of DIMS is to record the disaster event report gathered from various information sources such as field surveyors, instant messaging groups, twitter or other useful resources and then to be confirmed by the command center (coordinating with Villages) so BPBD can publish the official version of the disaster event in Jakarta. The DIMS is in progress to transform into Open-DIMS to make it more manageable and inclusive. This system will later be integrated with JakSAFE, Command Center (that will record the manual water level in water gates), sensors (weather stations and automatic water level recorders), and it will serve Smart City through the API.

In the recent development phase, JakSAFE will be merged with this new DIMS. The previous JakSAFE is not yet fulfill the end-to-end business process of Rehabilitation and Reconstruction Division in BPBD. It only consists of ad-hoc reports in the form of tabular data. JakSAFE has been newly enhanced. The feature now covers not only damage and loss estimation and exposure identification but also extends to development function for Rehabilitation & Reconstruction module on Open-DIMS.

III.3. COLLABORATIVE APPROACHES

All of the efforts to strengthen the risk information presented above are the result of institutional collaboration to reduce flood impact in Jakarta. Each of these institutions contributes their expertise and resources to overcome one of Jakarta most frequent disasters. The goal is to participate in providing solutions that can sustainably reduce future disaster. These institutions also benefit from the lessons learnt and potential scale-up in different location and hazards.

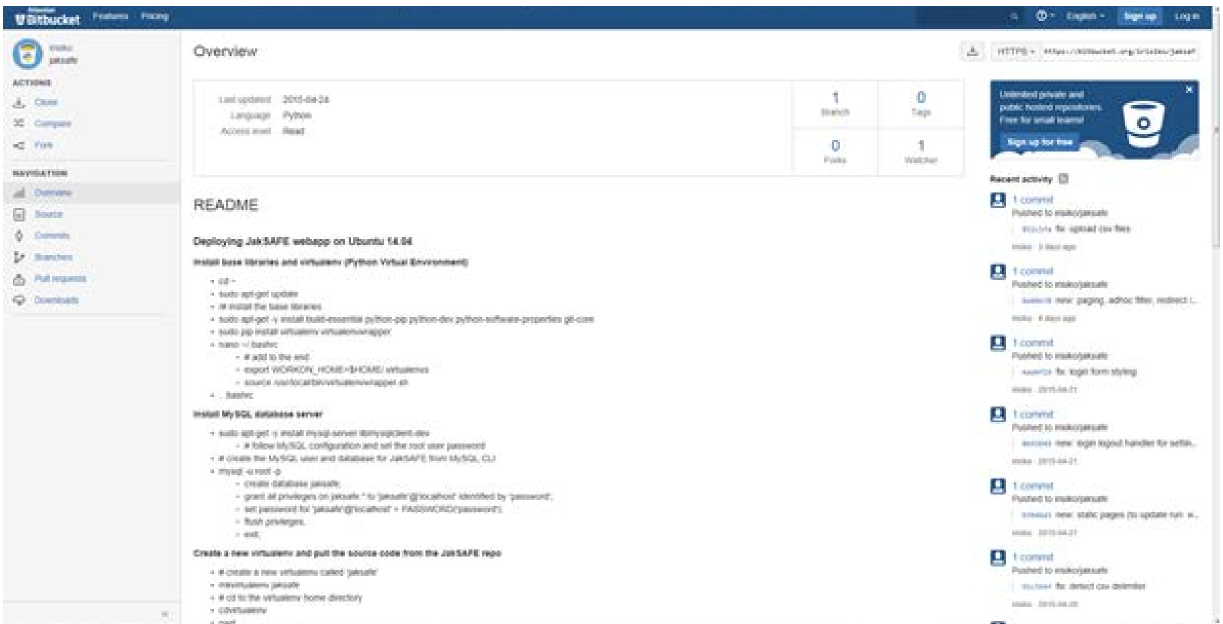
The same nature of collaboration is also demonstrated through the use of crowdsourcing platform and open source tools. Most of the boundary and infrastructure data used in the tools above are retrieved from OpenStreetMap (OSM), the biggest crowdsourcing and open spatial platform. In April 2016, more than 2.4 million users are registered in OSM and around 25,000 users actively contribute every month . InaSAFE and JakSAFE are both open source projects, where contributors around the world can use, learn the code, develop their own version and improve the software.

III.4. METHOD AND EFFECTIVENESS

There are several methods used in strengthening the risk information components in Jakarta flood management. It involves strengthening human resources and software used by a disaster management agency.

On the initial formation of BPBD DKI Jakarta, it relied on assistance from international institutions, such as

Figure 17: Jaksafe Code Repository Is Publicly Available At Bitbucket Platform



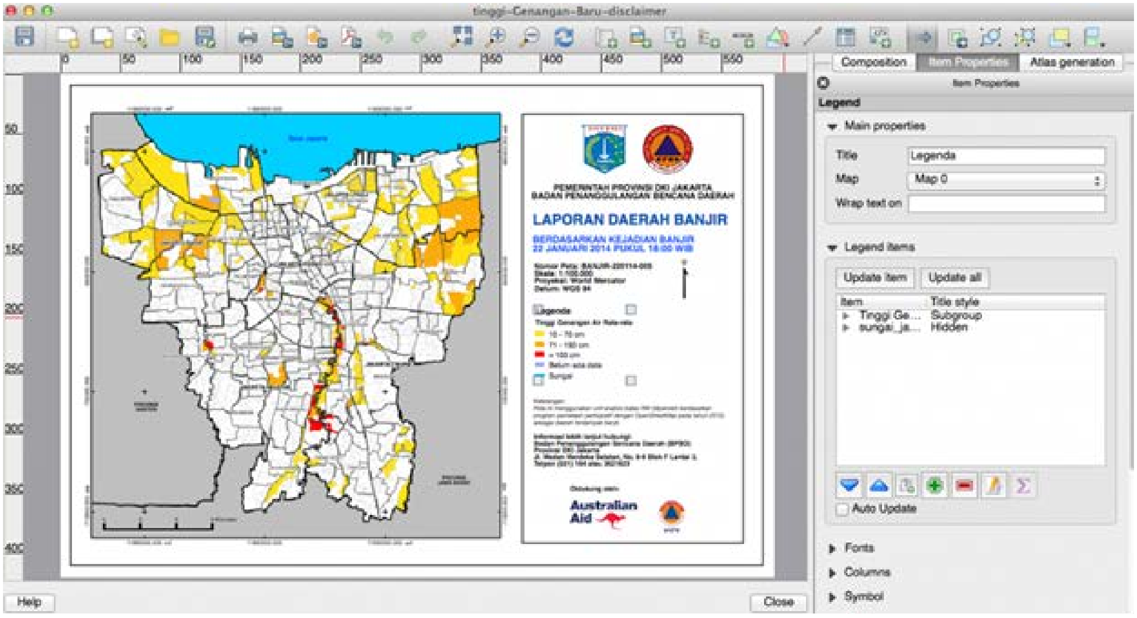


Figure 18: The Use Of Open Source Gis During Jakarta Flood Response
(Source: Openstreetmap.id)

World Bank, UN OCHA and AIFDR/HOT, to manage its geospatial data. These institutions provided seconded geospatial information management officer to assist during emergency response and produce maps of the flood situation, which significantly supported emergency relief operations. In the background, institutional support and expert advice were also provided for the flood analysis. Later it was extended to flood preparedness phase, by providing a team of expert and skilled mappers for the RT Mapping project in 2014-2015. The same team also supported the flood response in 2015.

In parallel with this progress, BPBD DKI has also started recruiting its own information management personnel. Starting with GIS officers in 2014 and then continued with more GIS officers and data management analysts in 2015. They have also continuously received transfer of knowledge from international institutions to increase the capacity as well as to ensure the sustainability of the knowledge acquired in the previous floods.

Various data and software developed in the chapters above have also transformed Jakarta disaster management capability by using collaborative approaches versus conventional hiring of data or software consultants. The use of open source software significantly reduces the cost of adoption and the effort can be focused on the use of the software rather than its development aspect.

The use of participatory geospatial data has been consulted with the national mapping authority (BIG), yet there is no prior experience from the agency to deal with sub-village level boundaries or even beyond that. Therefore, Jakarta is the first to initiate such detailed level data. Law number 11 of 2011 on Geospatial Information also allows the use of multiple geospatial data sources in disaster management.

III.5. RESULTS - COMPARING PAST AND RECENT PRACTICE OF USING RISK INFORMATION IN DECISION MAKING

Looking at the past challenges and the efforts to overcome them, there are significant progresses in the area of information management to support decision making. First, a lot of manual and conventional processes are replaced by information system. In the past, disaster management personnel needed to record flood report in the spreadsheet and then used the aggregated number as an official report to the decision maker, this is exemplified by the figure below.

The tabular format is useful to capture and aggregate flood report, it is also used to identify flood prone villages/sub-villages and then develop flood mitigation and preparedness strategy in the future. Yet there are challenges on how the manual input is prone to error and it is hard to generate automated analysis out of the format above. The development of Disaster Information Management System (DIMS) in 2013 was aimed to solve it by capturing the real-time flood reports into the information system. The system can process and provide quick analysis of the flood situation.

In 2014, BPBD DKI Jakarta started to move into map from tabular report to communicate flood condition to the public as well as for decision makers. During heavy rainfall, the agency periodically released flood map to give

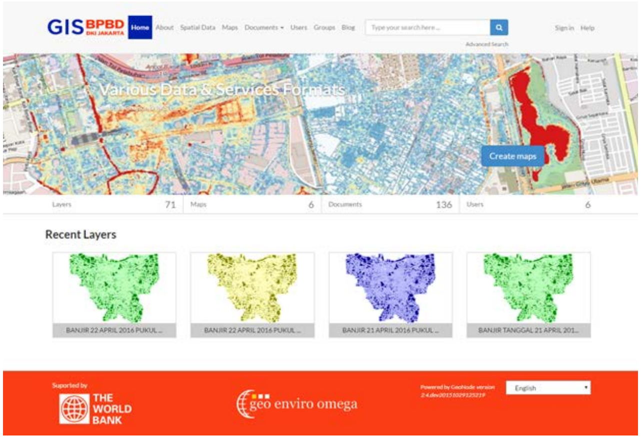


FIGURE 20: GEOPORTAL OF BPBD DKI JAKART (HTTP://GIS.BPBD.JAKARTA.GO.ID/)

the update on the extent of flood down until sub-village administrative boundary. In 2015, this effort leveraged further into the development of geospatial portal so that the map products and the source can be stored and managed. The use of web-based geo-portal ensures easier access for the stakeholders. This would certainly change the paradigm from data user to data provider.

The use of geospatial portal enables more advance analysis of flood not only internally but also by external stakeholders through its data sharing features. This will eventually lead to better decision making before, during and after emergency.

FIGURE 19: REGULAR FLOOD REPORT IN 2014 (SOURCE: OPENSTREETMAP.ID)

LAPORAN BANJIR
KAMIS, 24 JANUARI 2014
S.D. PKL.06.00 WIB

Kel.		KETINGGIAN	JUMLAH TERDAMPAK						PENGUNGSI (JIWA)	KORBAN MENINGGAL		LOKASI PENGUNGSI	
		Kamis, 24/01/2014 S.D. 06.00 WIB	KEC	KEL	RW	RT	KK	JIWA		Jml.	Ket.		
JAKARTA TIMUR													
KECAMATAN JATINEGARA			1										
Kel. Kampung Melayu		30 - 300 cm		1	8	68	2308	7698	7713			17	LOKASI
Rw. 01	6 Rt	30 - 300 cm			1	6	142	419	963	1	Hidayat (35)		Sudinkes Jaktim
Rw. 02	11 Rt	30 - 300 cm			1	11	1002	2921	185		warga		Masjid Attawabin
Rw. 03	2 Rt	30 - 300 cm			1	2	75	158	312		Rt.08/12		RS. Hermina
Rw. 04	Rt. 1,2,3,4,5,6,11,12,13,14	0 cm			1	10	-	-	531		sakit		Gereja Konoinia
Rw. 05	4 Rt	30 - 300 cm			1	4	93	269	200	1	Zulfikar (22)		Kantor Lurah Cawang
Rw. 06	1 Rt	30 - 300 cm			1	1	30	76	363		Warga Rt. 11/01		SDN 01 Kmp. Melayu
Rw. 07	10 Rt	30 - 300 cm			1	18	445	1771	117		Kel. Cipinang		SMP. 26
Rw. 08	12 Rt	30 - 300 cm			1	16	521	2084	566		Besar Utara		GOR Otista
									86		terbawa		Pos RW 03
									75		Arus		Musholiah Khairul Anam
									370	1	H. Masri (76)		SDN 02 Balimester
									3561		Warga		Jl. Jatinegara Barat
									120		Rt. 06/06		Madrasah Baitul Khoir
									85		kel. Bidara Cina		Masjid Jami Ithihadul
									35				Pos RW 07
									41				Masjid Ruhul Islam
									103				Ex bengkel Trimatra

IV.WAY FORWARD

IV.1.PLANNING AND MAINTAINING THE SYSTEM

Establishing a system should not be the end goal as the system is expected to grow and adapt to user requirements and changing environment. There are several ways on how current progress can be further leveraged. Existing administrative boundary and infrastructure data needs to be periodically updated to reflect the real condition. So far only 35 out of 267 villages have the most detailed data down to RT level. This needs to be expanded to cover the entire village, with priority on the disaster prone villages. Current internal government funding mechanism will require couple of years to continue this expansion and data update. Alternatively, collaboration with national and international institutions could be sought to speed up the process.

Information of assets is dynamic. They will change as the city changes. Thus, a system that enables data sharing and updating among agencies should be developed.

In the spirit of open data and open platform, BPBD DKI Jakarta is currently working on opening up its data and information to general public. DIMS is now in the process of being upgraded into OpenDIMS to support broader collaboration with existing and potential partners.

IV.2. DATA MANAGEMENT

With the information system built and running, the next step is to have stronger internal capacity to manage the data that are both produced internally and from external sources. This is something beyond most of the disaster management agencies in Indonesia, where normally the data management function is outsourced to external companies or consultants. This does not mean that data management needs to be closed and isolated. It implies that collaboration between internal capacity and external institutions will result in bigger impact as what have been demonstrated in the previous chapters.

Activities that encourage collaboration between institutions need to be integrated into data and information management agenda in the future. The goal is to have strong data management capability through collaboration among partners. This will eventually benefit all parties involved and result in a safer future for all.

Public access to information is crucial. The Information should made accessible and visually communicable to people. It is expected that the information will benefit people to manage themselves to prepare before and during an event of disaster.

V.3. USE OF THE SYSTEM FOR OPERATIONS

The availability of accurate spatial data on boundaries, contour delineation, flood response assets and system for DaLA calculator provides a comprehensive basis to utilize the entire risk information tools for operational purposes. Different applications can take advantage of the data and system already built to respond to specific operational needs such as functional analysis of the existing flood control and mitigation system, or linking flood event monitoring and reporting to the citizen reporting application of the Jakarta Smart City.

As an illustration of the application for functional review of the flood mitigation system, the city of Jakarta recently completed a series of measures to increase the capacity of the Ciliwung-Gunung Sahari canal through dredging and heightening of the embankment (see Figure 15A). While essential construction works have been completed, the canal system still has gaps in several locations due to the existence of permanent infrastructure crisscrossing the canal such as railroad and major roads that cannot be easily modified (see Figure 15B).

Using a combination of various geospatial data including: field survey of the gap

points, digital elevation model, cross section from as-built-drawing of the canal, flood hydrograph and tidal data, and the RW maps, spatial distribution of the potentially flood affected areas can be identified (Figure 16). Based on this analysis, urgent measures to prevent and reduce the impacts of this predicted flood/leakage could be properly planned and carried out. Such measures may include construction of temporary structure such as parapet wall to block the leakage, or deployment of mobile pump in areas where inundations are expected. The resulted maps and lost of the potentially affected neighborhoods (RWs) can also be used to alert the citizens and increase their preparedness.

The City of Jakarta currently also utilizes an application that allows citizens to report various complaints, including the occurrence of flood, to the Jakarta Smart City portal (smartcity.jakarta.go.id). This application is also being used by the city administration to respond to such complaint leading to the system being very active and current. The application also allows city officials to report back on the problems that are being handled (Yellow color) and those that have been resolved (Green color) as shown in Figure 17. Such a dynamic system provides real-time source of live data that can be used to validate flood occurrence. All yellow flags, for instance, could be interpreted as confirmed flood report that can be used to generate official flood inundation maps more frequently during the time when there are many reports received on the same general geographic locations.

Location	Critical Time	Discharge (m^3/s)	Number of RWs potentially affected
3	04 00 00	- 65,5	24
6	01 15 20	- 50,1	8
1 (tanpa tanggul)	04 00 00	- 65,5	16
5	04 00 00	- 65,5	10
4	05 45 00	- 107,7	5
2	05 45 00	- 107,7	5

Figure 21. Simulation of areas (RWs) potentially affected by floodwater coming from the gaps

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Collaborative Mapping of Detailed Geospatial Data for Disaster and Climate Resilience in Indonesia

Trias Aditya, Iwan Gunawan

Suryani Amin, Hoferdy Zawani, Ruby Mangunsong

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May 2017

PREFACE

The purpose of this technical note on collaborative mapping is to serve as a reference and guidance in applying collaborative mapping approach to support the land governance and detailed spatial planning. Surveying and mapping activities are indispensable activities to provide detailed geospatial information as a good foundation to develop diagnostics and problem solving alternatives in multi-faceted urban development that deals with disaster management, slum and poverty eradication. The strategies and techniques for coordinated data compilation, validation and improvements involving government officers and community representatives through collaborative mapping are presented in three different case studies in post Merapi eruption rehabilitation, Winongo and Ampal river area redevelopment. Those three case studies represent their own environmental problems due to either natural disaster (e.g., in case of Merapi) or climate driven flood inundation. The maps and geospatial information produced are seen as unified base canvases for supporting detailed spatial planning.

The provision and quality evaluation of base maps in collaborative mapping process are fundamental for accelerating geospatial data compilation and validation through participatory interaction. The information derived can contribute towards integrated and comprehensive spatial planning, disaster management, urban and rural land governance and development at site and local level.

We hope that this technical note can be used as technical reference to many on-going national initiatives toward one map policy implementation.

We would like to thank our local and national partners in Merapi area, Winongo and Ampal Riverbank during the implementation of pilot projects, the showcases reported in this technical note.

Authors,

May, 2017

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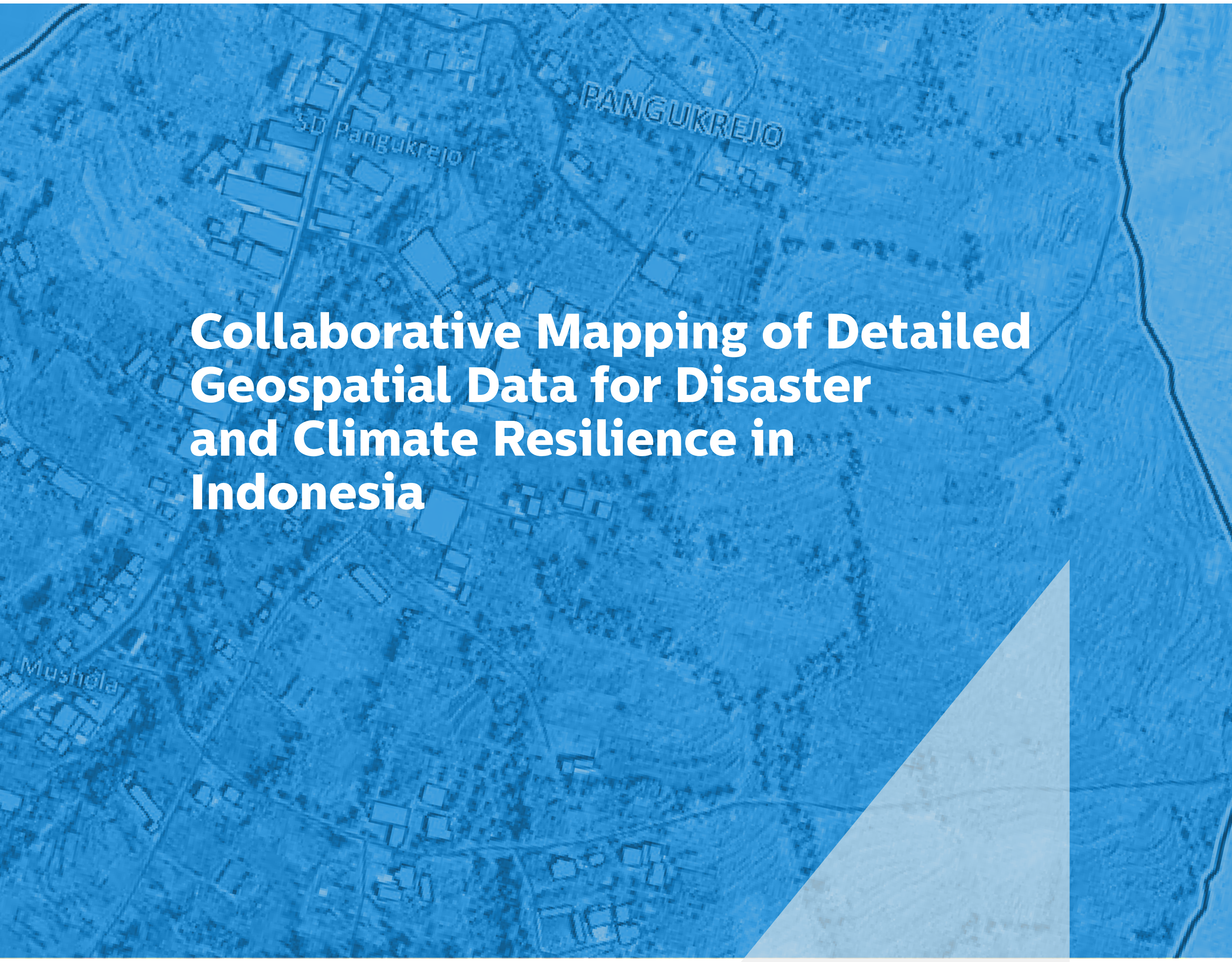
Collaborative Mapping of Detailed Geospatial Data for Disaster and Climate Resilience in Indonesia



“Collaborative mapping creates a unified agreed-upon local basic and thematic maps usable to support planning and disaster management”

I. Context

The chapter provides an introduction to the concept of collaborative mapping and justification on how the approach could be used to respond to the need for detailed geospatial data for planning and problem solving. The chapter elaborates the framework and sequencial process to come up with a solution.

I.1. Definition

Collaborative mapping denotes the process in producing a reference local map presenting basic and thematic geospatial information that were acquired and compiled through joint survey and mapping activities involving local government, community and relevant stakeholders. The collaborative processes encompass a series of joint data acquisition and compilation, synchronization, verification and presentation using corrected aerial imageries or high resolution satellite imageries as the base images. Collaborative mapping's area of interest may start from the smallest unit area (e.g. neighbourhood areas) to larger area (e.g., block, corridor, or village) in a district or city blocks. Collaborative mapping processes may involve heterogeneous data (in the same level of detail) , various organizations, different perspectives, but the product should be used as a single reference for all parties, yet must comply with geometry quality requirements set out by the national mapping agency.

The notion of collaborative mapping here should be differentiated with participatory mapping. Participatory mapping emerges as a tool to provide convenient ways for community members to engage and participapte in planning or decision-making processes (see Aditya 2010). Kryger (2002) specified that participatory mapping utilizes a wide range of graphics visualization to encourage community participation in expressing spatially referenced views and deliberation (Rinner 2001, Cai and Yu 2009). While participatory mapping focuses on methods and processes in producing community-based maps (Craig and Elwood 1998, Sieber 2006, Chambers 2006, Elwood 2006), collaborative mapping here focuses on methods and processes to facilitate integration of government and community maps through field verification, structured discussions involving community members and government agencies.

The scientific foundation for Collaborative mapping closely related to Collabortive GIS which centered on the design, process, and methods in utilizing geospatial data and explotatory tools as well as structured discussions in a community to produce spatial planning and problem solving as well as decision making (Balram and Dragicevic 2008). Collaborative mapping here is seen as an advancement of participatory mapping design and processes in order to ensure the acceptace and use of community maps into actions.

I.2. Rationale

The lack of detailed spatial data required for supporting spatial plan and disaster responses hinders quick and accurate responses. Yet, many data acquisition and compilation initiatives can easily be found across the agencies, especially after a disaster event, on which the data accessibility and its quality differ from one agency to another agency. It has always been a challenging task to deal with heterogeneity of the data and their quality, avoiding possibilities for data sharing and the joint use of the data. This can be exemplified in many disaster events. Right after the disaster strikes, disaster responders and managers had difficulties to find and access detailed map including impacted areas, elevation data and detailed map depicting exposure information such as buildings, infrastructures, land uses. These detailed map and other spatially referenced information are needed by disaster responders and managers to support their plans and needs for coordination in the phase of disaster responses, relief and reconstruction. In case that the access is not a problem, the data might be available partially from one agency but might not be relevant to be integrated with other specific data from another agency because of the different level of detail.

The provision of a basic map seen as a base canvas in collaborative map production is crucial. An agreed and unified base map is the key asset to enable detailed thematic information integration. In that way, critical issues to city/district development such as flood risk mapping and slum mapping can be draped into and analysed accordingly.

That prerequisite map is important to be available at a city level in order to ensure that community-based spatial plan and government plan are using the same base map. As a such, the collaborative map canvas mashes up community and field data with local government /technical agencies data, enabling one map policy at local level (top-down and bottom-up data integration). The product of a collaborative mapping activity can then be used to support response and development program such as detail spatial planning, disaster risk planning, and land development. The application of collaborative map represents in this book is focused on the preparation of a detailed plan layout with oriented to, among others, the disaster risk reduction.

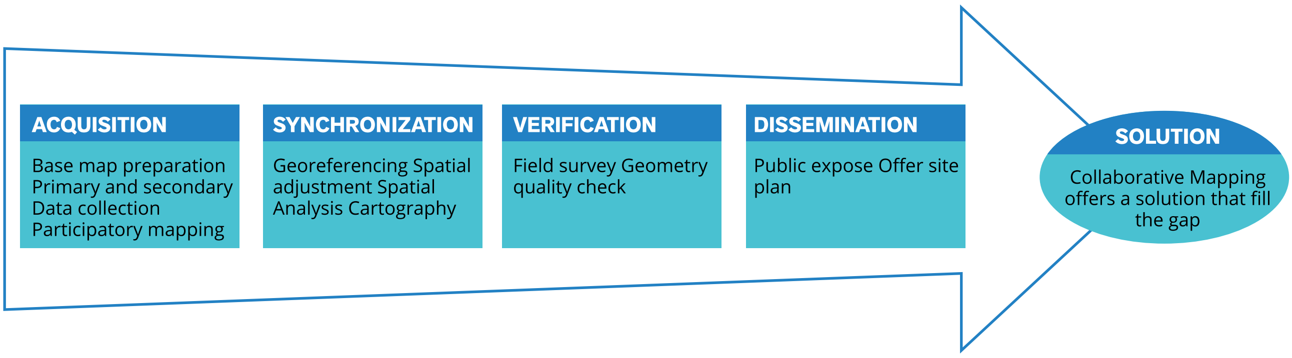
Figure 1 depicts a sequence of activities executed in the collaborative mapping process. The activities involve various stakeholders including the local disaster office, the local planning office, village officers, a community group of settlement planning, starting from data acquisition till validation. In each stages (acquisition-synchronization-verification-dissemination), discussions and inputs are annotated to geospatial features seen on the map, enabling the working map as a proxy to facilitate government-community communication and map updating.

The collaborative approach that follows this track of actions has been proven to be effective and efficient in answering the need for a single reference map to be used for planning and development in post Merapi eruptions. The activities were done in 4 months in total and the result is then used by local agencies, village officers, land office to support many planning and development activities, including land recertification for burnt areas. Collaborative maps that were produced were checked by both community representatives and local government/officers. Community representatives who inherit local knowledge contribute to data acquisition and verification through multiple participatory mapping sessions (see more in Chapter IV).

Local managers/officers who own underlying data and information contribute to the provision of secondary data and participate in the data verification activity. Collaborative maps are the outcome of the integration of top-down and bottom-up approaches. It offers more trusted and accurate map representations than just participatory maps. It creates a new information value attached to the collaborative map which can be seen as a joint effort accomplished by various agencies and groups in establishing a formalized geospatial information reference to support city/district developments.

Figure 1.

A sequence of activities done in collaborative mapping process



I.3. Drivers

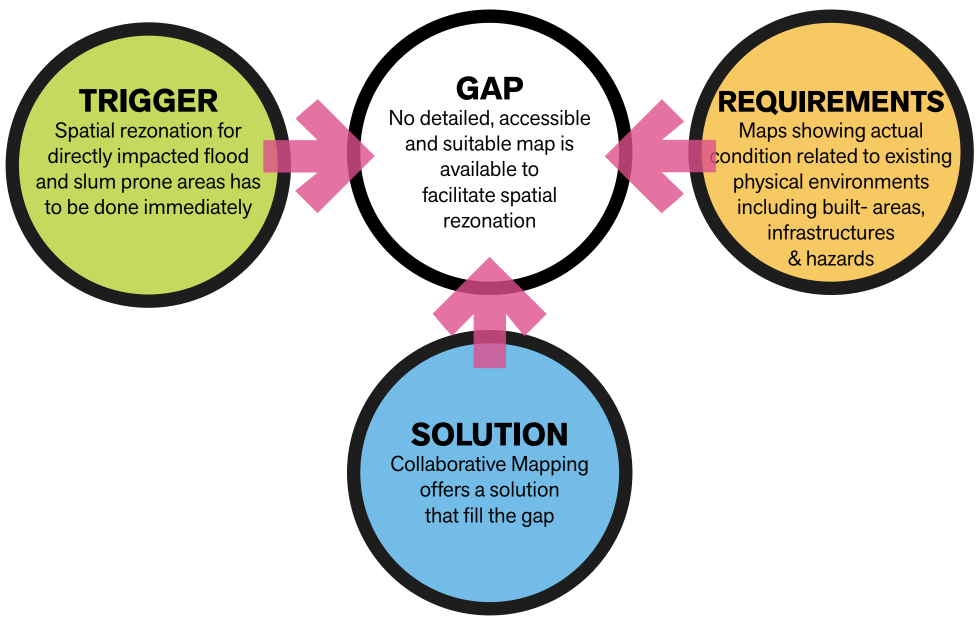
Local government is often required to provide appropriate and accurate spatial plans either in response to disaster events or in support of city redevelopment. Unfortunately, as found in many cities and districts, those spatial plans are difficult to be gained as different data quality from various agencies exist. Using existing practices and protocols, the data compilation and synchronization will take place very slowly. In addition, the basic map and thematic information are either not accessible or available. Yet, they have not been validated by community and relevant stakeholders. For that reason, in order to produce validated maps and information, government maps and community-based mapping needs to be integrated. This is where collaborative mapping offers a solution to fulfil the gap, as illustrated in Figure 2.

I.4. Gap

Poor detailed geospatial data availability and data management (e.g., low data availability, data with varied quality, managed by different users, not ready for spatial adjustment, lack capacity on spatial data management) cause local government and community fail to deliver appropriate and accurate responses and planning. For example, before Winongo collaborative map is available, the province and local governments of Yogyakarta had difficulties to calculate which and how many land parcels and buildings that will be affected by riverbank readjustment when the project is done.

Figure 2

Collaborative mapping framework: the mapping processes and the product connects the trigger and the gap to provide requirements for effective and efficient disaster risk and climate change management



I.5. Reasonable Deliverables

Some deliverables that can be produced from conducting collaborative mapping activities include:

A. Local government recognizes unified, agreed-upon geospatial datasets suited to planning and disaster management theme in a specified area.

Local government must be encouraged to take actions to use and endorse uses of good quality of geospatial data as a unified and formal resource in dealing with multipurpose city planning and development problems. The verification and involvement of national mapping agency, in case the basic imagery is not with them, in quality assurance is crucial to justify the appropriateness of the imageries used in collaborative map.

B. It helps the government to realize development plans, to better address poverty, and to reduce disaster vulnerability.

Government has been troubled with implementing development plans due to low quality of spatial datasets and management. One map would help them reduce geographical uncertainty leading to increasing transparency for investments, better program aligning, well targeting of beneficiaries and helping for effective program's monitoring and evaluation.

C. It supports the implementation of National One Map Policy (Single Reference, Database and System) at a city level, thus turning OMP into actions in support of local government.

As the local government shows high commitment, the collaborative map fulfils the demand for data access and data uses mandated by the Presidential Regulation No. 9/2016 about Acceleration on Implementation of One Map Policy at Scale 1:50,000. Indonesia's One Map Policy is an effort to establish a unified, agreed-upon geospatial dataset (e.g., land use, land tenure, disaster areas) that informs decision making at the sub-national levels. A unified, agreed-upon set of thematic geospatial datasets could benefit Indonesia in many ways. By increasing integration and synchronization of geospatial boundaries and areas across themes, it would help avoid unnecessary overlapping claims, reducing conflicts and inconsistencies. This is the first step toward the creation of a unified basic map of state lands, at least at scale 1:50,000, which currently not available. Critical to the One Map efforts is to operationalize the data sharing mechanism that promotes (as much as is possible) transparency, consistency, information sharing, and accountability. Acceleration to the provision of both basic map and thematic information that suited to on map policy thus becomes inevitable. Collaborative mapping support One Map Policy efforts by creating a unified agreed-upon local basic and thematic map (larger scale map than 1:50,000), usable to support sub-district and village-based spatial planning and disaster management.

What is collaborative mapping activity?

Collaboration is a joint activity that involves multi parties in a mutual working group that involves task sharing and synchronization that aims to achieve an ultimate goal. In participation ladder perspective, collaboration is an activity that is one step ahead from coordination and two steps ahead from cooperation. Collaborative mapping in this case study is a kind of mash up that combine various resources into one final product which is agreed map on disaster zone, sub village boundary, and buildings for spatial planning purposes.

What to collaborate?

Here is example from Merapi Collaborative mapping in 2013:

Data: Aerial photos, satellite imageries, GIS data, community spatial plans

Tools: GPS/GNSS geodetic type for accurate positioning, GIS software (QGIS), and Mobile GPS

Methods: Scientific data processing and participatory mapping/planning

Stakeholders: BPBD DIY/Yogyakarta Provincial Disaster Management Agency (coordinator), BPPTKG/Research and Technology Development of Geological Disaster, BIG/Geospatial Information Agency, Bappeda Sleman/Sleman District Development Planning Agency, BPBD Sleman/Sleman District Disaster Management Agency, DPPD Sleman/Sleman District land Control Department, BPN Sleman/Sleman District Land Office, PU ESDM DIY/Yogyakarta Provincial Public Works, Energy and Natural Resources Agency, Bappeda DIY/Yogyakarta Provincial Development Planning Agency, Balai Besar Serayu Opak/Serayu Opak River Basin Development Agency, Government of Umbulharjo, Kepuharjo, Glagaharjo villages of Cangkringan sub-district, REKOMPAK/Community-based Settlement Rehabilitation and Reconstruction, and university researchers

One Map Policy at a Glance

The One Map Policy term has been known since 2011 but the action has been slow. There is a new momentum following the July 2014 election of President Joko Widodo. One Map was first introduced under the President Susilo Bambang Yudhoyono Administration and was included in the Law on Geospatial Information (Law No. 4/2011). President Joko Widodo identified One Map Policy as a priority after taking office and re-confirmed his commitment as part of his CoP21 speech. In February 2016, the President issued a Presidential Regulation (9/2016) mandating acceleration of the implementation of One Map Policy at 1:50,000 of scale. Although not directly usable for collaborative mapping and detailed mapping at local level, this policy has been very positive to accelerate to the notion of one data for one development purpose. A working group lead by the Coordinating Ministry of Economics has been defining the scope of work for accelerating One Map Policy implementation that includes:

- Compilation of thematic data collected from agencies and local governments,
- Verification of data for data integration
- Synchronization within integrated data

The Geospatial Information Agency (BIG) chairs the Implementation Team, facilitating reconciliation upon conflicting data that requires cross-agency coordination. Coordination means collecting base maps and networks of survey control point and integrating thematic land information from various sources. Currently the Ministries of Energy and Mineral Resources, Environment and Forestry, Agriculture, Marine and Fisheries, Public Works and Housing, and Transportation, as well as the National Land Agencies all have authority to make sectoral maps. Under One Map, these agencies will continue to produce, maintain and update their respective datasets, but will make them accessible through a geoportal managed by BIG.

Objectives

It mainly aims at producing a single yet unified detailed map representing basic layers of the city/district (existing buildings and settlement areas, transportation features, water and hydrographic features, administrative and local areas e.g. neighborhood area borders) plus focused thematic information depicting topic of interest including disaster management, slum alleviation, land development and city planning. The project activity is therefore enabling a collaborative platform within the city by which local governments and community representatives develop a large-scale risk mapping. The resulting map feeds into Neighbourhood Development Planning to increase resiliency towards disaster and climate change. The maps should be easy to use and updated by local governments.

Process and Activities

The collaborative map comprises of basic map and thematic layers that are produced from digital high resolution imageries. The source of imageries can be from aerial photographs, satellite imageries, or UAV (Unmanned Aerial Vehicle) images. The use of UAV is limited to some extent, mainly because the requirements to comply with national standard is considered uneasy (e.g. extensive uses of high accuracy Ground Control Points (GCPs), additional terrestrial height survey to improve z values, permits from transportation agency). The process to create the map can be divided into two main work, technical work and non-technical work. Technical work covers the development of orthorectified imageries (when the data has not been vertically corrected), raster to vector data conversion, and across agencies' data integration. Non-technical work include: engagement with local partners (government, local experts, and community), multi-stakeholders dialogue, and multi-stakeholders' verification and agreed upon. The general flow, how the technical and non-technical work evolve in the activity can be seen in Figure 3.

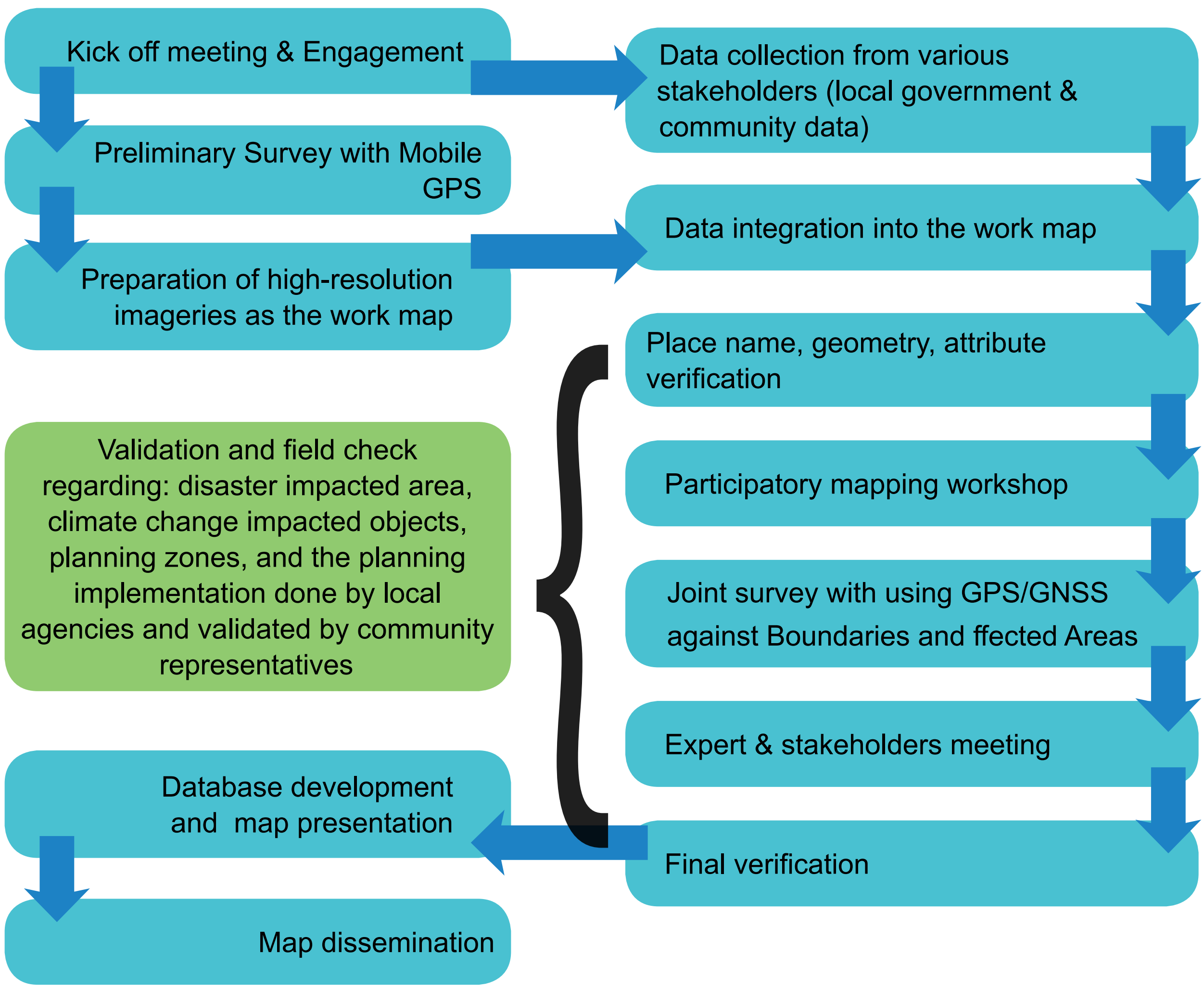
The flow of processes can be summarized as a follow:

a. It starts with coordination and engagement with the local government and local partners. Engagement with local governments, local experts and community must be done before the project was really started.

b. It must facilitate multi-stakholders' dialogue for data acquisition, compilation, verification and forum to resolve disputes over data representation and quality.

c. It must integrate various data into a spatially referenced platfrom admissible for planning and development purposes.

Figure 3
General flow of the processes



II. Method

The chapter presents required survey and mapping activities including participatory mapping activities for producing collaborative maps.   One of essential items to be assessed is the availability of aerial imageries to be used as a base imagery to plot and combine multi theme geospatial data matches with community participatory data.

II. 1. Approach

The keywords for the approaches undertaken in the collaborative mapping approach are: unified and validated large-scale map for planning and development, integrating top-down and bottom-up data, compliance to national map standard. In order to produce an agreed and reliable collaborative map, the following activity should be undertaken.

a. The activity establishes a geometrically correct and thematically validated large scale map (at scale 1:2,500 or 1:5,000) produced from an orthorectified high resolution imagery to help mainstreaming disaster risk management into development decisions. Given the relatively small area, this practice requires intensive collaboration from related stakeholders to agree on method of data compilation, validation, improvement.

b. It formulates thematic information outputs where the quality of its underlying basic map (at scale 1:2,500 or 1:5,000) are in compliance with National Map Standard and Guidelines, thus adding more confidences to local government and stakeholders to accept the map as the reference for follow-up disaster management and planning activities.

c. It employs local engineers and technician, preferably with GIS and geomatics engineering background, who have knowledge and experiences in working with community and in facilitating the mapping processes, including in facilitating validation and participatory mapping sessions.

d. It accommodates community participation in populating thematic data and in validating government data, enabling top-down and bottom-up.

e. It provides reliable yet simple methods for handling multiple data gained from different parties with various quality and levels of details (e.g. coordinate transformation, rubber sheet processes, map adjustments, and data selection and integration).

f. It provides spatial analysis for real world problems found in the field (e.g. detailed information on houses will be impacted directly by lahar, houses and land parcels within the building-free river embankment zones) that is useful to give insights to decision makers to plan scenarios for solutions.

The key challenge is to provide aerial imageries that meet requirements to be used as the base layer for detailed maps (scale 1:5,000 or larger). Currently, aerial imageries that are feasible to be used as the base layer must be orthorectified imageries which means the imageries have been corrected from errors due to topography variation and due to images distortion. The aerial imageries can be produced from very high resolution satellite imageries (e.g. having pixel size equals to 51 centimeters) or aerial photographs taken from (UAV) or aerial plane.

The methods can be broken into sub activities of spatial data collection, processing, validation and analysis. Technically the method include preparing orthorectified imageries, doing field verification survey, cross agencies data collection and compilation, participatory mapping, and cartographic work and analysis.

II. 2. Preparation of Orthorectified Imageries

In case satellite imageries have been orthorectified (e.g., by BIG), then the imagery can be used as a canvas layer to enable data integration and verification. In case the imageries have been from aerial photographs, it should be assumed that the imageries have been geometrically corrected.

Geometrically corrected here means:

a. The imagery has been adjusted to local horizontal position using highly accurate GCPs, measured using Geodetic GPS. The number of GCPs depends on the city/district area to be surveyed. For instance, a city that are covered by 2 scenes of high resolution satellite imageries (e.g., 1 scene: 16 km x 16 km) require 20-30 points of GCPs for a scene, depending on the terrain (topography surface) of the area.

b. The set of imageries must then be tied into DEM (Digital Elevation Model) of the city/district area to remove earth curvature effect and to improve coordinate accuracy. This process can be achieved using Remote Sensing/GIS software utilizing rigorous orthorectification approach.

The easiest way for local agencies to know whether the high resolution imageries are available for their city/district areas is to contact the national mapping agency about this. Further when the data is available, a formal request should be submitted to BIG to get the data.

Orthorectified imageries must facilitate multi-stakholders' dialogue for data acquisition, compilation, verification and forum to resolve disputes over data representation and quality. See **also Base map options**

II. 2. 1. Preliminary Survey

Preliminary survey are needed to check whether the coordinates are correctly calculated. Further, the images radiometric quality should be checked in order to make sure the imageries can be used as the canvas for participatory mapping activities. Preliminary survey also include delineation of neighborhood and villages' boundary together with village officers.

Joint Accurate GPS / GNSS Survey

Joint GPS/GNSS survey sessions were executed to produce validated sub village (dusun) boundaries and validated ATL boundaries. GPS Surveys for sub village boundaries updating were done by local government officers and village officers and sub village leaders. ATL boundaries validation activities were done together lead by BPPTKG and followed by BPBD DIY, BPBD Sleman, village officers and sub village leaders. GPS researchers and assistants were acted as facilitator/GPS operator and analysis.

All GPS surveys were documented using standard forms conveying detail implementation and signatures from representatives of stakeholders involved in the survey activities.

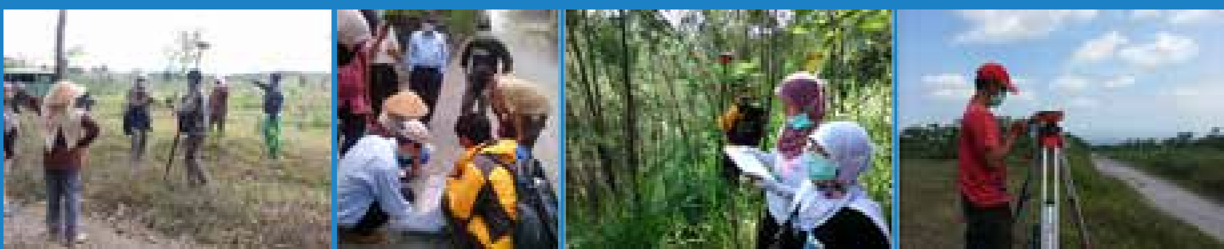


Figure 4
GPS Survey Activity

II. 2. 2. Use of Unmanned Aerial Vehicle Mapping when necessary

UAV can be used to cover missing areas or to cover small areas (e.g. less than 1000 ha) where required imageries are not available or they are available but with bad quality (e.g. clouds cover). It can be used with maximum concerns (e.g. must comply with transportation agency and telecommunication agency permit requirements). When it is done, field GCPs and additional field surveys especially for surveying terrain values are strictly required.

UAV flight mission must be designed properly in order to produce good quality aerial imageries covering the project area. Flight height of UAV must be in compliance with Ministry of Transportation Regulation (specified in the regulation of Ministry of Transportation No. 90/2015). In this regulation, it is specified that when the UAV's flight height is above 150 meters, the flight mission must be done under the government's permission.

GCPs must be installed on the field before the flight mission starts to control the resulted photographs. GCPs should be distributed in good numbers and must be surveyed using Geodetic GPS devices. UAV is equipped with high digital camera resolution to produce aerial photos and with GPS sensor to ease the flight control. In recent development of UAV devices, the camera can also be equipped with post processing kinematic GPS (PPK GPS) to enable better accuracy of UAV imageries.

II. 2. 3. Field survey

Field survey is needed to gather information on administrative boundaries and to collect additional data. Administrative boundaries and neighborhood boundaries are surveyed together with community representatives and local government officers.

Field survey is necessary in order to check the produced imageries and to make sure that orthorectified imageries can be used as the reference background for collaborative mapping Additional data collection sometimes is necessary. For example additional topographic survey especially using Total Station survey instrument to validate the riverbank profile.

II. 3. Cross agencies data collection and compilation

In order to collect all existing data regarding basic layers (administrative boundaries, buildings, land uses, infrastructures) and disaster related zones (impacted areas, hazard prone areas zonation, planning zonation) from stakeholders in the city of Yogyakarta, a series of institutional visit to technical agencies is required.

The visit is intended to collect all available yet related data in the project area. Later, the collected data are compiled and then plotted into the orthorectified imageries used as the base canvas.

II. 4. Participatory mapping

Participatory mapping is required to verify government spatial data and to collect views and aspiration of community members in forms of maps. In applying participatory mapping, the government can involve actively as facilitators or participants. In practice, participatory mapping can be utilized:

a. To facilitate community groups to validate geographic features, administrative boundaries of aerial imageries;

b. To facilitate community inputs regarding hazards, problems and proposed development;

c. To convert community maps from community mapping activities as spatial features plotted on top of the referenced aerial photos.

Participatory mapping can be done either through participatory mapping workshop or through joint field validation. In a participatory mapping workshop, a facilitator should provide guidelines and directions to make communication and coordination among participants can be effective and efficient, producing an accurate and complete participatory map (Aditya 2010). Participatory maps through photo maps were considered as the most effective means for community members to engage and produce maps.

II. 5. Cartographic work and spatial analysis

Cartographic work and spatial analysis are required to be done using Geographic Information System software. The work includes data compilation of secondary data and georeferencing work, rubber sheeting as well as boundary adjustment of multi theme geospatial data. For this purpose, orthorectified imageries can be seen as the reference data. The complete cartographic work and spatial analysis may include the task:

a. To digitize spatial features of building and public infrastructures as vector data;

b. To symbolize detailed data on transportation, settlement infrastructure, land parcels effectively for visual communication purposes;

c. To develop spatial analysis to investigate population density, building density, settlement infrastructure suitability, and disaster infrastructure needs in the project areas;

d. To visualize the results in forms of maps;

The result of cartographic work and spatial analysis is subject to be discussed and improved. For this purposes, a focus group discussion is necessary. The discussion can be focused:

a. To discuss with the expert on the recommendation based on the field activities;

b. To conduct a mapping workshop at the end of the program;

c. To develop standards and protocols for conducting joint survey involving stakeholders and community.

Participatory Mapping Workshops

Participatory Mapping workshops were done involving sub village leaders, vilage officers, local government officers in order to :

Validate and update the geometry of geospatial features of houses and buildings, roads, sub village boundaries and directly impaced areas (ATL) zones

Validate and enrich geospatial attributes of buildings and houses in 3 villages including building construction parameters, building use, clean water source, electricty,name of house hold leaders.

Figure 5.

Participatory mapping workshops for validating and updating geometry and data attributes attributes

III. Base Map Options

As stated earlier, one of motivating objectives for going with collaborative approaches is that the availability of basic geospatial data (e.g. geospatially referenced data layers) is poor, especially the availability of large-scale maps suitable to support local planning and disaster mitigation. Large scale maps, e.g. maps with scale 1:2,500 and 1:5,000 are essential to support local spatial plan or to develop detailed contingency plan (see Table 4.1.). Such large scale maps mostly were produced either from LIDAR/aerial photogrammetry mission or from satellite imageries data acquisition. As of 2015, it is reported that the coverage of large scale maps in Indonesia is very minimum, far too low for supporting local government agenda to provide spatial plans and disaster risk plan.

According to national law (UU No. 24/2007 on disaster management and No. 26/2009 on spatial planning), local government must provide plans represented in forms of planning maps. To fulfill this need, local agencies need to ask government agencies (in this case BIG and LAPAN) to provide the data. Most of data required by local agencies are high resolution satellite imageries or aerial imageries. As required by the authority, the imageries must have been orthorectified. It means that coordinates of the imageries must have been corrected against the ground control points and have been adjusted into digital elevation model of the mapping area.

The lack of basic maps and satellite imageries has pushed many local government initiate own survey and mapping missions. In principle, options for orthorectified imageries can be done through photogrammetry mapping (producing aerial photographs using airplane or UAV), satellite imageries acquisition and processing. In principle, the decision to choose which method to be implemented by local government highly depend with the level of detail to be achieved and the budget allocated by the local government. For instance, for supporting spatial plan that require map at scale 1:5,000, the use of orthorectified high resolution satellite imageries is sufficient. In order to produce maps with larger scale, local government need to have higher accuracy of imageries which only can be achieved using photogrammetry method (but not with UAV). Uses of UAV imageries could still be accepted for relatively small areas (e.g., not larger than 1,000 ha) or for corridor mapping where field control points and observations should be more than enough.

Table 3.1

The scale of maps and its practical use

SCALE	DESCRIPTION	USES
1:10,000	Houses and buildings look tiny tend to be grouped	Micro zonation
1:5,000	Houses and buildings look small but still visible	Detailed spatial plan
1:2,500	Houses and buildings look clear	Preliminary design and block plan

Table 3.2

Types of data sources for producing base layer in collaborative mapping

SENSOR/SOURCES	SCOPE	OUTPUT	BUDGET
Aerial Imageries+LIDAR	Basically not limited but will be efficient for > 10,000 ha	Aerial Photos+DEM	6-10 USD/ha, the larger area the cheaper the cost
Satellite Imageries	Not limited depending on the imageries availability	Imageries*	Minimum 1,200 USD/ scenes for archives
UAV	Smaller area (<1,000 ha), corridor shape area (5-8 km or smaller)	Imageries **	2-4 USD/ha

* It can be converted into orthorectified imageries when high resolution Digital Elevation Model (e.g. Map Contour from 1:10,000, elevation data from active sensors (LIDAR, SAR) are available.
** It can be converted into orthorectified imageries GCPs and more height measurements on the field are required.

Quality assurance

Quality assurance is mandatory especially to validate planimetric/horizontal quality of the base map becomes crucial because the data will be used by local government and local agencies. BIG owns a responsibility to assess and to check the base map quality. The result of the check will be the document specifying whether the result meet the quality requirement or not.

The result of the analysis should meet the required accuracy, e.g., for a map with 1:5,000 scale, the horizontal and vertical accuracy must be less than 50 cm (for scale 1:5,000) and less than 50 cm (1:2,300). In Winongo collaborative mapping mission, the basic map acquired from UAV photographs were successfully assessed by BIG and accepted as base map for the Winongo area at 1:5,000 (Type I) or at 1:2,500 (Type II).

IV. Case Studies

The studies have been dealt a lot with riverbank with disaster prone areas. Riverbank have been the good example on how effective spatial plan and monitoring have been crucial point to prevent and mitigate disasters. Riverbank areas in both Yogyakarta and Balikpapan are vulnerable to flood, landslides where settlement and disaster mitigation infrastructures are not well in place. The collaborative mapping cast stakeholders to explore problems and solutions through the map. The map is seen as a proxy to find best possible solutions for improved disaster risk reduction.

As the studies aim to produce a map to be used as a reference, the quality of the base map becomes crucial. For that reason, the base map of collaborative map, developed from aerial imageries or aerial satellites, must comply with national standard on the base map accuracy (BIG regulation No. 15/2014). This standard can be seen as quality assurance policy that the city and districts must meet when utilizing base maps in developing city plan and block plan.

The following parts will present case studies in utilizing collaborative mapping methods. The first is utilization of collaborative mapping approach in villages in Sleman impacted by the Merapi eruption for post disaster recovery. The second and third are the use case of collaborative mapping studies in Winongo and Ampal Rivers for risk sensitive urban redevelopment.

IV. 1. Mount merapi post-disaster recovery

CONTEXT

Mount Merapi is a very active stratovolcano situated between Central Java and Yogyakarta Province. The last major eruption was happened in 2010. The total damages and losses reached over four trillion rupiahs and have displaced more than 200.000 people according to a joint assessment study conducted by BNPB (National Disaster Management Authority), World Bank, UNDP in 2010. In 2011, community-based settlement rehabilitation and reconstruction project was initiated. The families relocated from their burnt villages to permanent houses in safer areas. The relationship between trigger, gap, requirements that motivate the risk zone mapping in Merapi post eruption project is given in Figure 6.

A hazard map depicting hazard prone areas has been published by Center of Volcanology and Disaster Mitigation (PVMBG). However, projection of affected areas and hazard prone areas on the field is difficult to confirm on its accuracy, due to the small scale of the map, i.e. 1:50,000. Mapping of pyroclastic flow and lahar hazard prone areas using LIDAR Mapping and GIS modelling were done by the BNPB, PVMBG through Agency for Technological Development and Research of Volcanology (BPPTK). In addition, the Ministry of Public Works (PU) produce settlement zonation based on disaster risk zones.

Figure 6

Rationale for conducting Merapi Detailed Risk Zone Mapping

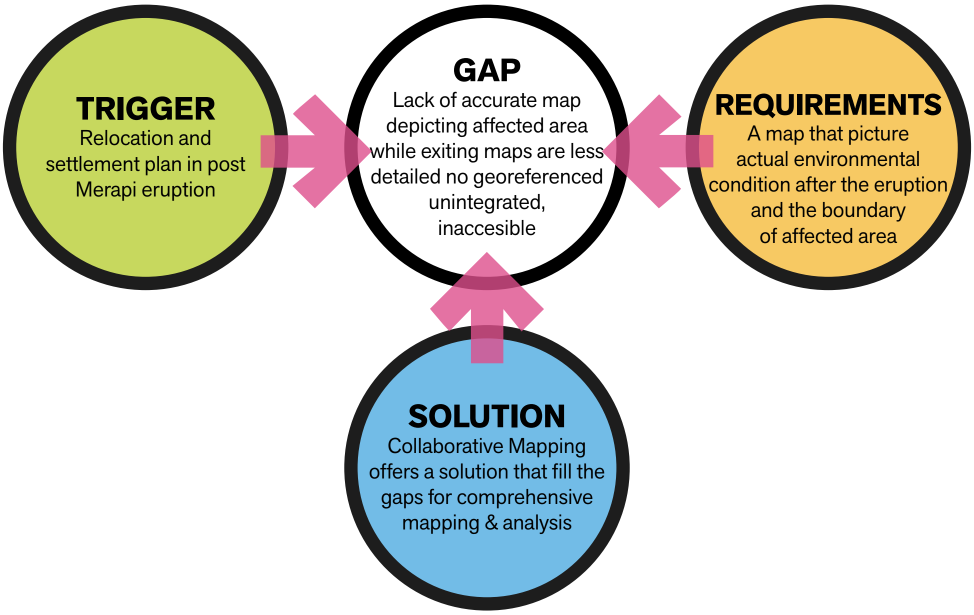


Figure 7
Footprints of Merapi lava flow

While there are many official maps concerning risk zones and safe settlements available, there are still difficulties to integrate and use the maps as decision-making support for operational planning and reconstruction activities. Meanwhile community maps, although maps provide detailed information, have no exact position on boundaries as the maps were not georeferenced. These facts raise two emerging needs for data integration and for ground truthing. Facts that available maps produced by various institutions and organizations were not created based on the same reference or standardised mapping system have made these maps difficult, if not impossible,to be integrated. Further, the available maps are also not accessible to the public while the mechanism for data dissemination is not effective and efficient. Thus, data integration require georeferencing processes and data management to make the data seamless and ready to be tested on the field.

Global Positioning Systems (GPS) and Geographic Information Systems (GIS) technologies for positioning and data management provide a solution on ground truthing on the field in order to develop collaborative maps depicting risk zones' boundaries.

COLLABORATORS

The mapping activities involved mainly BIG for technical consultation. BNPB and BPBD, Department of Public Work, River Authority (BBWS), BPPTK, National Land Agency provide existing hazard and thematic maps. Data gathering was facilitated by Bappeda of Yogyakarta province and Sleman District.

Primary data collecting involving district/village leaders. The data taken through series of discussion, interview and field survey. Community participation in the mapping processes became possible through the support from the team conducting Community-based Settlement Rehabilitation and Reconstruction (REKOMPAK) project.

The collaborators is working together in a joint survey and providing feedback during consultation workshop in order to validate the map. A group of survey and mapping team from University of Gadjah Mada (UGM) - a partner university was responsible to facilitate and implement technical work of the mapping supported byWorld Bank and GFDRR (Global Facility for Disaster Reduction and Recovery).

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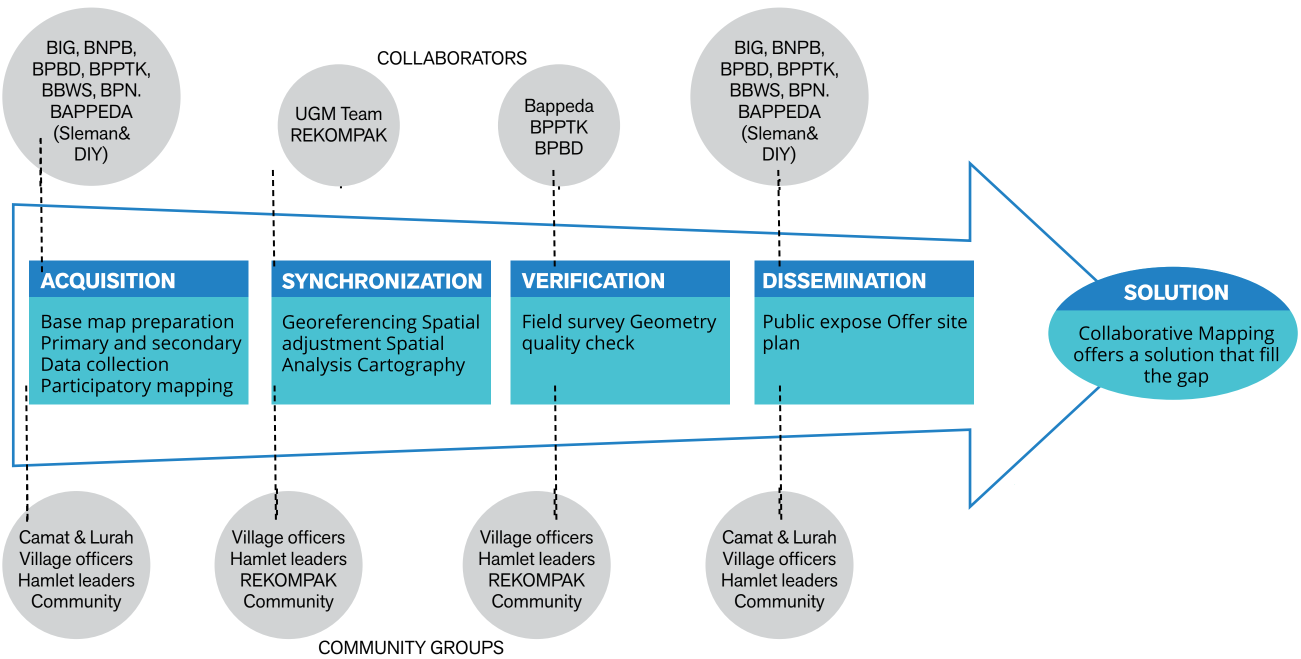
Figure 8

Stages in collaborative mapping in post merapi eruption



METHOD

The methods including :1) To collect all existing data regarding basic layers (administrative boundaries, building, land uses, infrastructures) and disaster related zones (impacted areas, hazard prone areas zonation, planning zonation) of Mt Merapi from stakeholders , 2) To make uses of latest products of large-scale mapping on Mt Merapi, i.e. LIDAR data and aerial photo maps produced by BPPTK and UGM (2012) as the reference background for collaborative mapping, 3) To convert community maps from REKOMPAK project as spatial features plotted on top of the referenced aerial photos, 4) To digitize spatial features of building and public infrastructures seen on the 2012 aerial photos as vector data, 5) To compile BPPTK maps on the potential hazards of pyroclastic flow and lahar flood, produced from LIDAR mapping and GIS modelling, 6) To develop standards and protocols for conducting joint survey involving stakeholders and community , 7) To conduct a series of precise GPS survey to delineate: administrative boundaries, past impacted areas, predictive hazard zones together with BPBD, Sleman's Technical Agencies, BPPTK, Bappeda, Village Leaders, Hamlet/Dusun Leaders, REKOMPAK, etc and 8) To discuss with the expert on the recommendation based on the result and field activities.

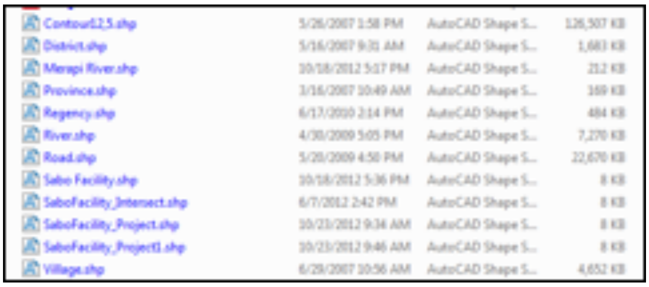
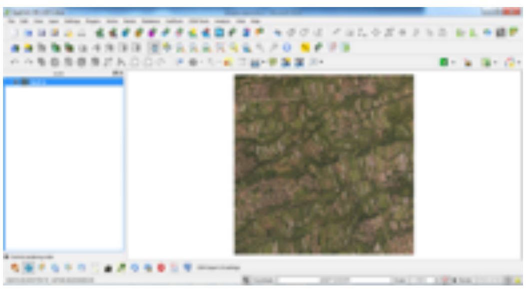
Figure 9

Field Validation activities

Figure 10

Participatory Mapping to validate the draft of maps at hamlet level

The following layers are secondary data coming from different technical agencies are compiled on top of the basemap on which the disaster related information are plotted.

TYPE OF DATA AND FORMAT	SAMPLE OF DATA PREVIEW
Detailed Spatial Plan (RDTR/Rencana Detail Tata Ruang) from Public Works Agency (JPG) / Rencana Detil Tata Ruang dari Dinas PU (JPG)	
River and dam infrastructures from BBWS Serayu Opak (SHP)	
LIDAR and aerial photos of Merapi and Yogyakarta from BPPTK and UGM (SHP)	

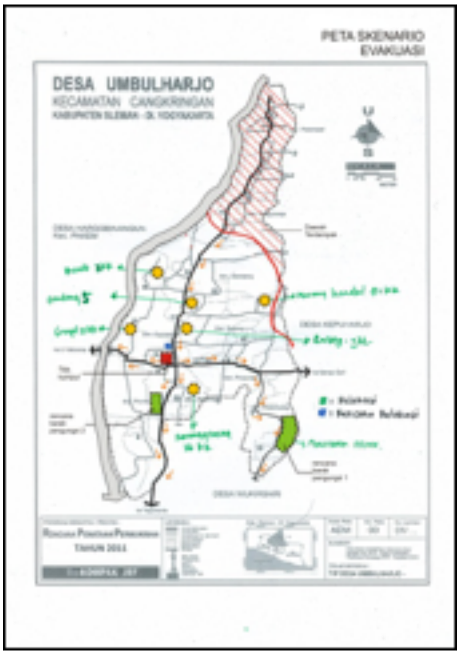
TYPE OF DATA AND FORMAT	SAMPLE OF DATA PREVIEW
Sleman District Land Controlling Department (SHP)	glagah_FeatureToPolygon2.dbf glagah_FeatureToPolygon2.prj glagah_FeatureToPolygon2.sbn glagah_FeatureToPolygon2.sbx glagah_FeatureToPolygon2.shp glagah_FeatureToPolygon2.shp.xml glagah_FeatureToPolygon2.shx kepuh_FeatureToPolygon.dbf kepuh_FeatureToPolygon.prj kepuh_FeatureToPolygon.sbn kepuh_FeatureToPolygon.sbx kepuh_FeatureToPolygon.shp kepuh_FeatureToPolygon.shp.xml kepuh_FeatureToPolygon.shx Umbul_FeatureToPolygon2.dbf Umbul_FeatureToPolygon2.prj Umbul_FeatureToPolygon2.sbn Umbul_FeatureToPolygon2.sbx Umbul_FeatureToPolygon2.shp Umbul_FeatureToPolygon2.shp.xml Umbul_FeatureToPolygon2.shx
Community Settlement Plan from REKOMPAK Sleman (PDF)	

Figure 11

Existing data available

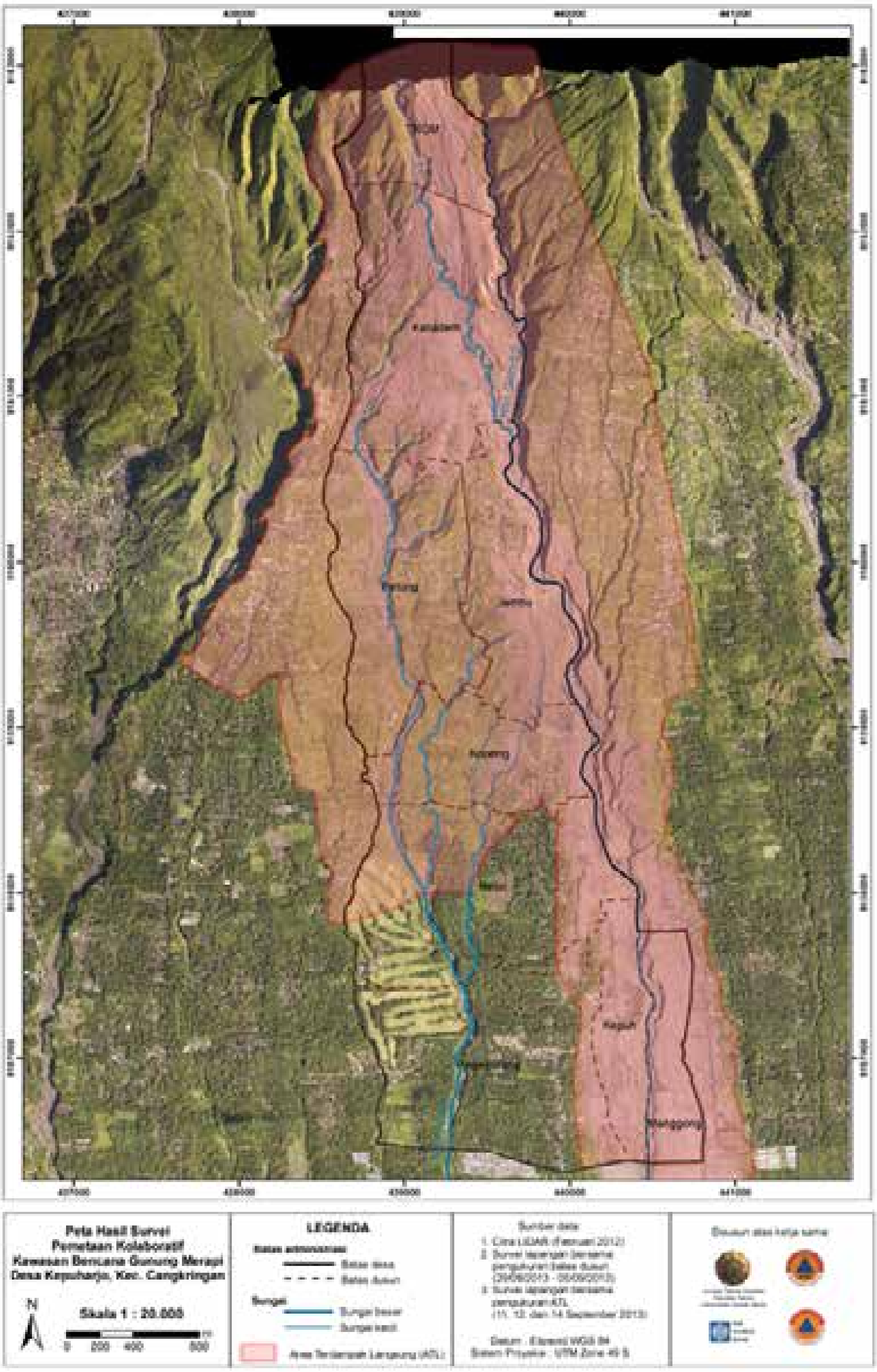


Figure 12

Sample of resulted detailed risk map

RESULTS

The collaborative mapping study of detailed risk zones in Merapi includes three villages considered to be the most villages at risk in Merapi namely Umbulharjo, Kepuharjo and Glagaharjo. The experiment resulted a detailed map of 3 villages in scale of 1:5,000 and detailed map of 27 hamlets in scale of 1:2,000 – 1: 3,000. The map depicting risk zone boundaries taken through the data integration, validation, ground truthing of the affected areas and consultation with experts.

The map comprises of georeferenced information of administrative boundaries, houses, pubic building and infrastructures. Delineation of hazard zones of pyroclastic flow, lahar, landslides as well as exposures such as houses and critical infrastructure in the area within the hazard zones was resulted by community members. The result from participatory mapping was then validated and supported with spatial analysis in combination with local leader's information and hazard expert's justification. The layers were then integrated with maps produced by PVMBG, BNPB, BPPTK, PU and REKOMPAK.

The resulted maps of risk zones were disseminated and discussed by 27 hamlet representatives. Record has been made on community agreement regarding 27 hamlet boundaries, local infrastructures and risk zones. This spatial database of Mount Merapi villages affected by disaster is disseminated to local stakeholders and managed by Yogyakarta Provincial Bappeda and BPBD.

The resulting data is converted into maps to enable local village and government to communicate the risk zones to communities and stakeholders involved in recovery activities, particularly to support the settlement plans. The maps have been used by the local government and REKOMPAK as the base information for decision-support in community-based settlement planning activities in the new area.

The availability of such detailed map have led to its use for BPN to conduct land consolidation and manage land administration for tenure out of risk zone area. As a result, families relocated to the new settlement whose land parcels directly affected by pyroclastic flow obtain certificates of ownership for their parcels.

Figure 13

New Settlement environment

IV. 2. Risk-Sensitive Urban Planning of Winongo River, Yogyakarta, Indonesia

CONTEXT

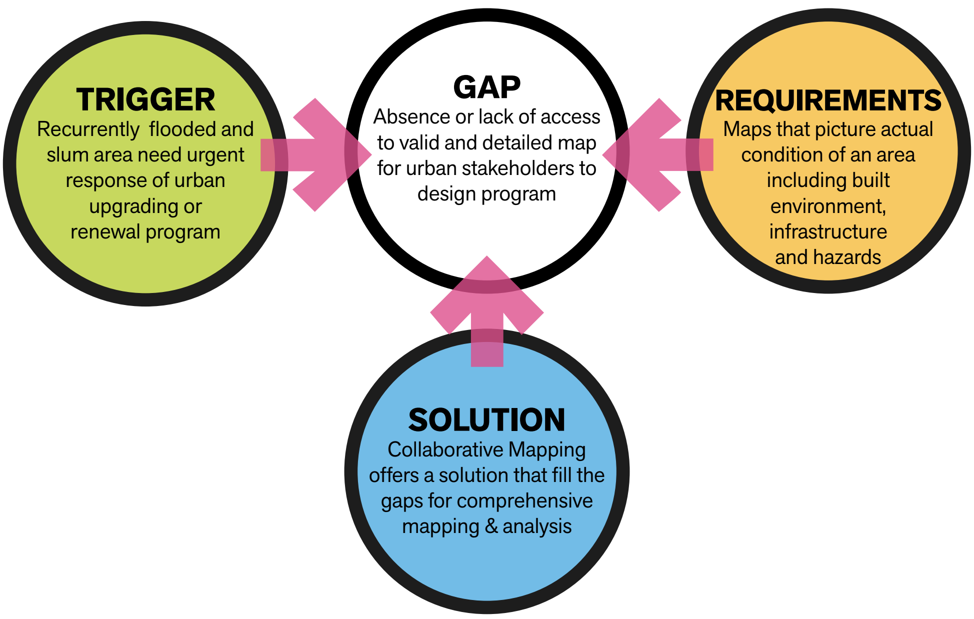
The Winongo River is one of the major streams that flow across the Javanese cultural rich city of Yogyakarta. The river holds critical roles in urban ecosystem and heritage yet it also overwhelmed with carrying capacity issues due to fast and uncontrolled development of urban settlements. River pollution, ineffective drainage system, poor domestic waste water management and lack of access to fresh water are daily problems people in the riverbanks have to deal with. Even worse, they also threatened by flood inundation, landslides, and fires that come across frequently with almost knowledgeable pattern. The relationship between trigger, gap, requirements that motivate the project is given in Figure 14.

The World Bank Disaster Risk Management (DRM) team held engagement with the city of Yogyakarta to figure out ways to address the gap. It is agreed to prioritize area that require immediate attention such as settlement that regularly flooded. The development of detailed, risk-sensitive urban spatial plans is critical for cities to adapt to and cope with uncertainty of natural hazard occurrences. However, the ability to create such plans is often constrained by the lack of available high resolution geospatial data that meet both technical and legal requirements in developing a formal block plan. Recent development in geospatial technology such as the handheld GPS, coupled with growing movement to involve citizens in local mapping activities have opened an opportunity to incorporate community-generated geospatial information into a formal planning process. The collaborative process in mapping offers solution to high resolution geospatial information that could facilitate people-oriented and risk-sensitve urban development.

The City of Yogyakarta named Winongo River as locus to deliver Detailed Risk Mapping that assesses vulnerability to flood and landslide. The selection of Winongo River represents growing area which require updates while base map is not available. Both hazards had been identified in the Bank's prior rapid risk assessment in Yogyakarta i.e. the City Risk Diagnostics which followed by the pre-feasibility study of Winongo River. The study recommends concept of "the Winongo Riverwalk" to address disasters and climate change issues that align with Yogyakarta City's vision to further develop its education, cultural tourism, and services sectors in a sustainable manner.

Figure 14

Rationale for Winongo Disaster Risk and Climate Change Mapping



As the city was keen to showcase the Winongo Riverwalk, one crucial step to realize the concept is producing Detailed Risk Map that picture segments of the river into high resolution spatial information, for instance a 1:1,000 scale of map, to allow vulnerability assessment be carried out with great detail. The resulted map can be used as basic reference to enable integrated spatial planning adhering to suitable settlements' structure and pattern in city planning to support sustainable development that taken into account hazard potentials, slums related problems (socio-economic, utilities, open space) and climate change impacts.

COLLABORATORS

The study can be seen as a business model of collaborative mapping broken-down into four steps based on input-output relationship (see Figure). Each step includes dialogue between data representative which in many occasions had lead to data conflict resolutions. In Yogyakarta, Bappeda took responsibility in leading the process. Aside from commitment of formal agencies, the study received support from the Winongo Community i.e. FKWA (Forum Komunikasi Winongo Asri) which was considered most proactive and well engaged with the city government in terms of community building, environmental protection and disaster mitigation planning.

In the study, a local team tied to Bappeda is needed to compile and reconcile data from institutions and community. In this study, the local team role was undertaken by the UGM team, whose expertise is related to geomatics engineering (including field surveys and geospatial analytics, community mapping and communication strategy to public officials). The mapping team ensures the project carried out in high level quality in terms of process and outputs.

METHODS

The methods implemented in the Winongo study is following the general approach and methods discussed in part II on Methods. In this study, the base map was acquired by utilizing UAV imageries with additional field topographic survey survey. Field survey activities include a survey to conduct precise GPS measurement to provide control points for UAV mission and topographic mapping and a terrestrial survey to measure riverbanks' topographic profile

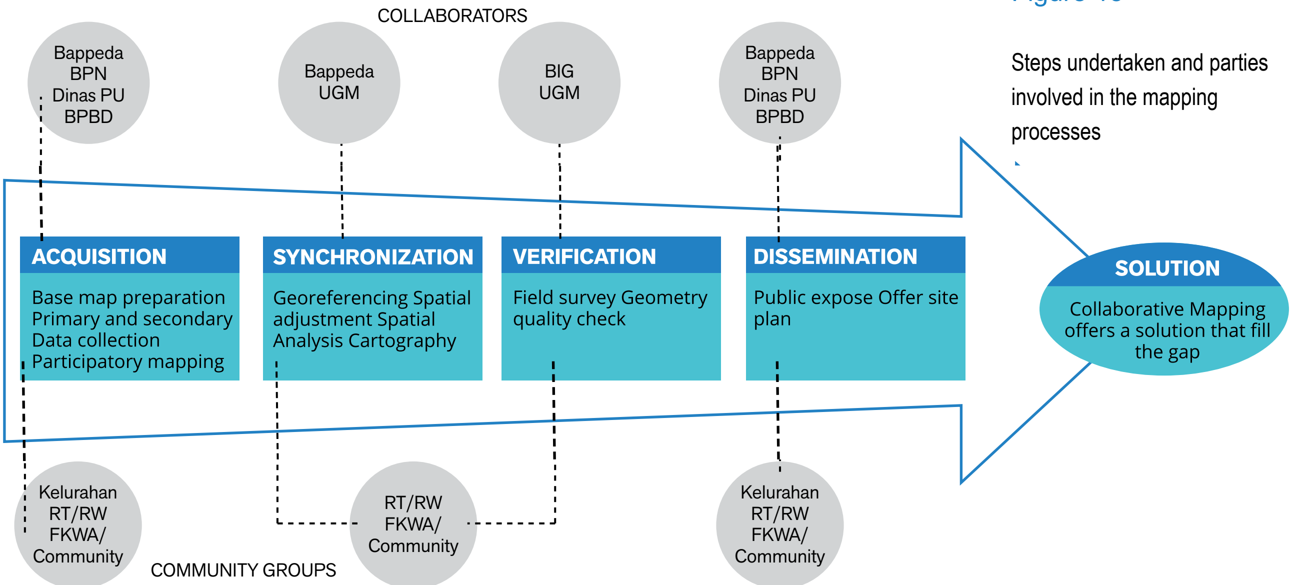


Figure 15

Steps undertaken and parties involved in the mapping processes using digital total station for improved digital terrain model. In regard to smallest unit of administrative boundaries, while the case study in Merapi post disaster recovery uses participatory mapping and joint field survey to delineate dusun boundaries, here in the Winongo Case, participatory mapping activities were used to delineate neighborhood boundaries (RT and RW boundaries).

Participatory mapping activities were attended by local representatives of 8 segments coordinated by FKWA. In total there were two sessions allocated for participatory mapping activity in each segment. Each session was attended by 10-20 local representatives. The first meeting session mainly to acquire spatial boundaries of neighborhood areas (RT, RW, block), settlement infrastructures, hazard areas and to copile spatially-referenced inputs from representatives regarding settlement quality and disaster management. The second session of participatory mapping, done in the end of the study after the final map is ready, was mainly done to disseminate the results and to accommodate corrections from the community members.

Cartographic work and spatial analysis were done iteratively to produce the base map and the thematic map of risk-sensitive urban development in riverbank areas. A ready-installed online map is also provided to the local government. The spatial analysis aims to illustrate the usefulness of the resulted map to help local government to handle possible relocation issues, land administration and urban development integration as well as to provide riverbank area upgrading scenarios to improve disaster risk infrastructure and settlement infrastructure quality.

There are at least two benefits of implementing collaborative mapping: first, it rearranges spatial governance by integrating spatial data with special thematic objectives into one georeferenced base map accessible for urban stakeholders. Various data and maps from different technical agencies are collected and integrated with community data which compiling community problems into one map. The map is a canvas to plot objects that have been built and problems that require solution. A detailed planning is created upon such canvas. The same reference allows technical agencies and community participate in planning and monitoring.

Second, it creates connection between community efforts in generating geospatial information with formal planning process. The participatory/ collaborative mapping generally serves two purposes: 1) engagement between the community and government experts on natural hazards and increase awareness of hazard exposure to community assets; and 2) updating and delineation of spatial objects to develop high resolution maps. Both processes constitute critical aspects in participatory planning, especially in the context of redefining spatial layout to mitigate future disasters (in this case flooding and localized landslide).

RESULT

The Collaborative Mapping at Winongo Yogyakarta delivers final outputs that include (1) data products both in the forms of high resolution base maps as well as the derived thematic maps from the collaborative process and (2) Module of Collaborative Mapping procedure for future use.

Risk-sensitive spatial plans can inform investment decisions including the definition of land-use designation that control new development and infrastructure layout in hazardous areas or the identification of necessary mitigation investments (e.g., including through land/spatial consolidation) to protect existing or future development. However, majority of cities in Indonesia lack of official high resolution aerial satellites and spatial database, this include Yogyakarta.

The critical point in project activities was to define the base map which is unavailable for Winongo River area. It was decided to produce high resolution aerial photos which serve as updated base maps, and to utilize the ortho-rectified aerial photos in collaborative mapping to delineate hazard zones and to map key infrastructures.

The specific products that have been completed at the end of the project are outlined below:

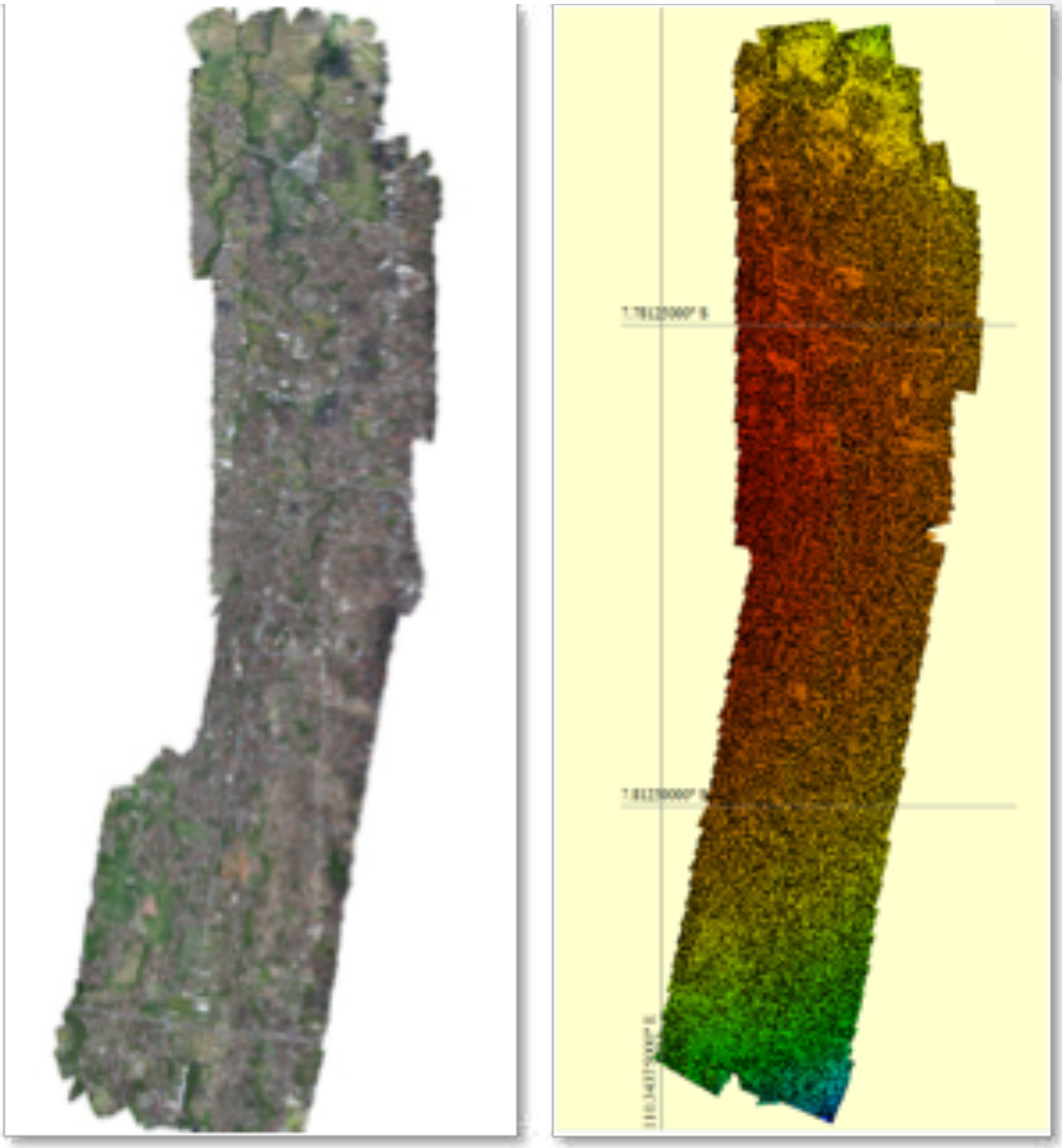


Figure 16

Mosaic orthophoto and DSM derived from UAV imagery

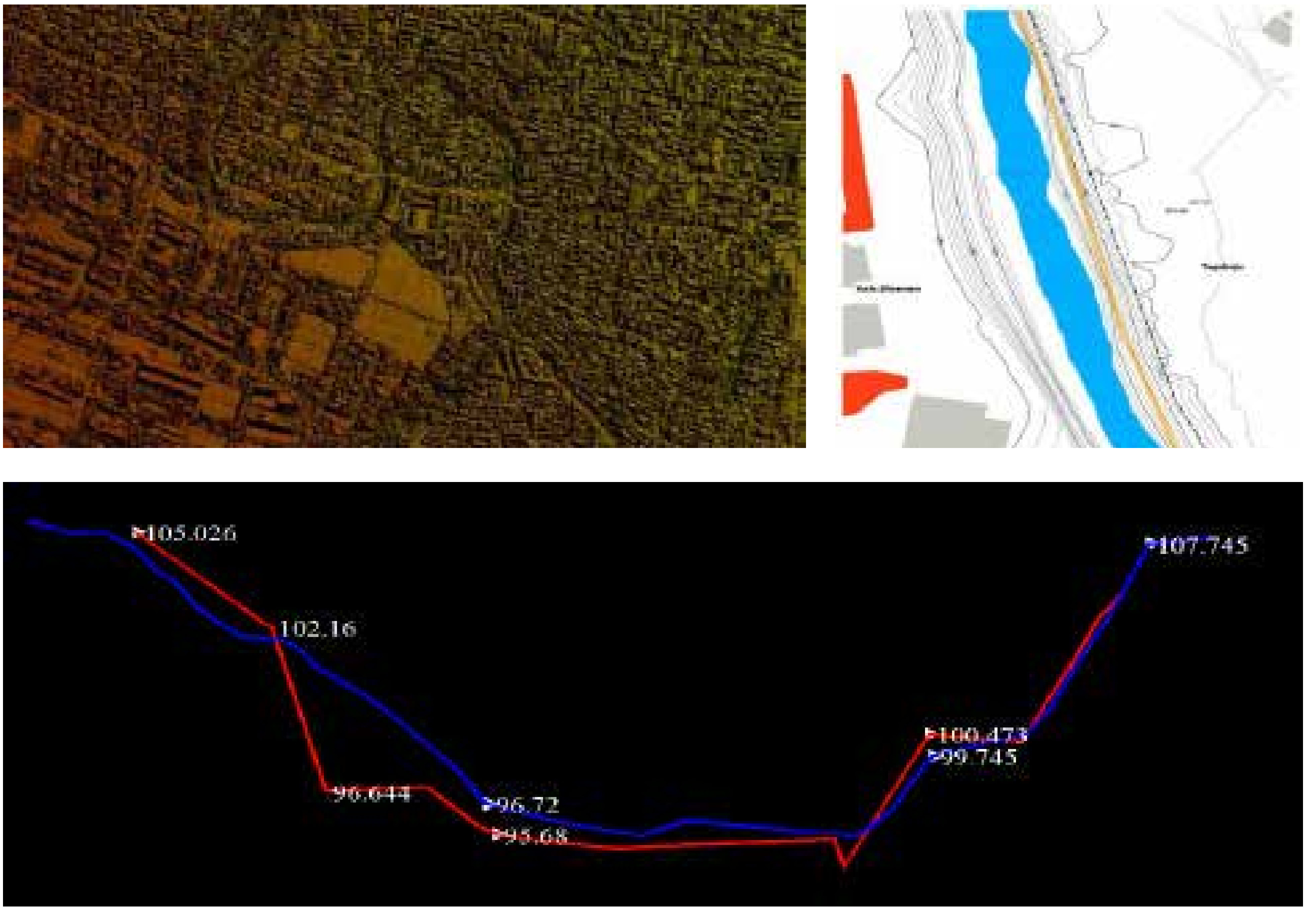


Figure 17

DSM (top left), Contour map (top right), Cross sections produced in the project (bottom)

1. Mosaic of Orthophoto and Digital Surface Model (DSM)

2. Two dimensional cross-section of the river

3. Collaborative thematic maps. There are several basic themes produced, including: settlement, environmental condition, land

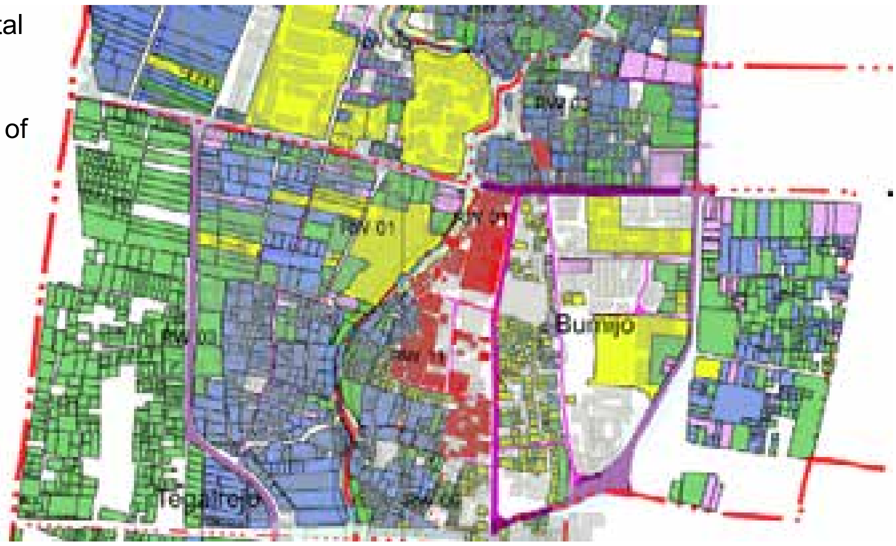


Figure 18

Land parcel by the legal status, the red one indicates blocks traditionally registered as the Sultanate Ground status, disaster response related facilities, and potential for tourism spots.

4. Spatial Analysis. The spatial analysis also constitutes as an important work and also as tool to engage stakeholders in building common understanding about hazards, risk and risk mitigation options. Several simple analyses to assess the overlap between space occupation and river buffer zone (as proxy to hazard boundary), population density of neighborhood blocks, evacuation route options, are among the examples of outputs produced by the analysisoverlap between space occupation and river buffer zone (as proxy to hazard boundary), population density of neighborhood blocks, evacuation route options, are among the examples of outputs produced by the analysis.

The thematic maps produced in this project have spatial accuracy that meets the Government's standard on provision of base map and the indicators as stipulated by the National Mapping Accuracy for the scale of 1:2,500.

Figure 19

Some spatial analyses produced from the project

Population Density Heat Map

Estimation of structures affected by applying the River buffer zone

IV. 3. Risk-Sensitive Urban Planning of Ampal River, Balikpapan

CONTEXT

Ampal River is one of the main rivers that flows through Balikpapan City, East Kalimantan. Areas surrounding the river is prone to floods and landslide due to excessive development in its upstream areas. A number of studies have demonstrated that changes in land use in the upper watershed areas of the river, from agricultural areas to settlement areas, have significantly reduced the water storage capacity of the land, thus increased the flooding intensity. A massive increase in the volume of surface runoff cannot be accommodated in Ampal River, which has already experienced severe siltation due to erosion at the upper stream. Increased concentration of suspended sediments has intensified from year to year and led to clogging in several points in Ampal River (Figure 20).

Balikpapan City Government was committed to rearrange and improve land use management in areas around the riverbank of Ampal River. For that purpose, the government needed a detailed mapping of the areas as a key instrument for spatial planning, which would need to be developed in a collaborative

Figure 20

Condition of Ampal River riverbank that experiences rapid development

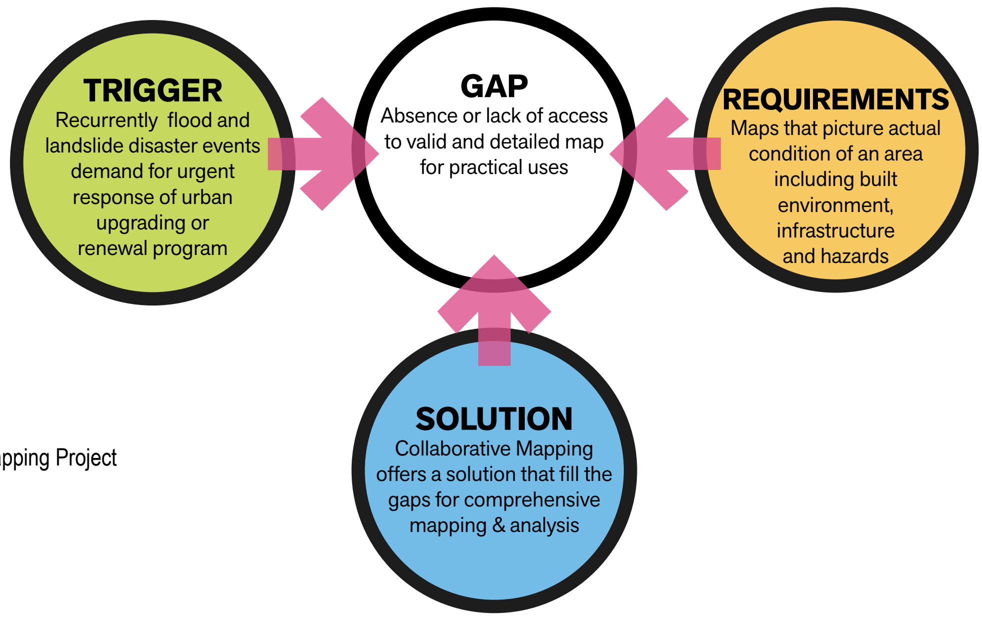


Figure 21

Rationale for Ampal Collaborative Mapping Project manner involving the relevant stakeholders. The rationale that motivates the project is given in Figure 21.

As a first step, a detailed map would be needed as a basic reference in spatial planning. Through the spatial planning the city government defined the spatial structure and settlement pattern appropriate to the city development plan, as part of the efforts to achieve sustainable development. Bappeda of Balikpapan City involved a Mapping Consultant Team from the Faculty of Civil Engineering and Planning of Balikpapan University to conduct a detailed mapping.

The goal of the pilot project in Ampal River was to build a collaboration platform among key stakeholders in the city to jointly formulate detailed risk maps and recommendations for the spatial planning of areas around the river. It was expected that the resulting detailed map could be used as a reference in the preparation of detailed spatial plan of Ampal River areas, with a view of making the areas resilient to disaster and climate change-related risks. The map would be presented in a user-friendly format that would be easy to understand, use and update by the city government.

COLLABORATORS/STAKEHOLDERS INVOLVED

AGENCY/ ORGANIZATION	ROLE
Balikpapan City Bappeda	• facilitated FGDs to identify issues related to land-use in areas around Ampal River • facilitated consultative workshops with the multi-stakeholders on the map and design of the target areas • coordinated geospatial data collection and other technical matters with the local sectoral units
Mapping Team from Faculty of Civil Engineering and Planning, Balikpapan University	• made data inventory from relevant SKPD • inter-local agencies survey • field survey • data processing and analysis
UGM mapping team	Quality assurance
Public Work Agency of Balikpapan City	prepared basic maps of Balikpapan City
Camat/Head of Sub-District	data verification and validation
Lurah/Head of Urban Ward	data verification and validation
Community	data verification and validation

METHODS

The methods implemented to complete the Ampal River case study is similar to ones implemented in Winongo and Merapi. Here the base map was produced from aerial imageries produced by BIG in 2015, thus capable in providing a better quality of geometry and radiometry aspects of imageries than the base map used in Winongo and Merapi.

While in Winongo, land parcel map representing land parcel boundaries and their corresponding ownership rights for the study area can be integrated well, here in Ampal project the land parcel map cannot be used for analysis due to data availability constraints.

RESULTS

The Ampal River pilot project had 3 outputs as the following:

a. Thematic map with a scale of 1:2,500 for the entire Ampal River areas
b. Flood Risk Map and Landslide Risk Map of Ampal River's riverbank
c. Design plan for Modern Market in Ampal River areas

THEMATIC MAP WITH A SCALE OF 1:2500 FOR THE ENTIRE AMPAL RIVER AREAS

The mapping team started to prepare detailed risk map of Ampal River areas by delineating areas that used to be affected by flood. To facilitate discussion and overlaying of the map, mapped areas were divided into seven segments. The mapping team used basic map and secondary data from Balikpapan City Bappeda and Public Works Agency in the form of aerial photos from 2014, topographical map from 2004, DED Normalization map of Ampal River from 2012, DED Coastal Road map of Balikpapan City from 2012, and Spatial Plan map of Balikpapan City from 2012.

Digitation of basic map was done by making vector data from aerial photographs of 2014, which were grouped into several layers including: street layer, building layer, land-use layer, river layer, and drainage layer.

Collaborative mapping was done after the field survey activities were done. The process involved community and government apparatuses from the urban ward/kelurahan level. Local government officers helped delineate boundaries between neighborhood and kelurahan areas, identify public and social facilities, validate these facilities, and provide missing information in the basic map such as flood and landslide affected areas, and the boundaries of these hazard-prone areas. Together with the community, they also proposed measures to reduce flood and landslide risks in their respective areas.

Stages in digital data processing from the primary and secondary data and data that came from field survey to make basic map included spatial adjustment of secondary data, survey inputs and attribute data, and spatial analysis. The subsequent process constituted validation workshop and verification of thematic maps, and compilation of data from new information obtained from the segment developed by stakeholders that would be used as pilot in the improvement of the land-use planning.

The last stage was finalization of the collaborative map by the incorporation of corrections in the form of addition of research areas, geometry of some objects, cartography, and map layout.

The large scale thematic maps contain the following information:

a. Administrative boundaries (urban wards, neighborhood areas/RT)
b. Land contour
c. River demarcation areas
d. Critical infrastructures (education, health, social and religious)
e. Land ownership status
f. Areas prone to flooding and landslide
g. Social-economic status
h. Land use classification (industry, settlement, etc.)
i. Location of control dam/water catchment
j. Potential land for consolidation

The thematic maps that had gone through the process of validation and verification were presented as a GIS database that would be used as reference by stakeholders in the planning and development of Ampal River areas in Balikpapan City.

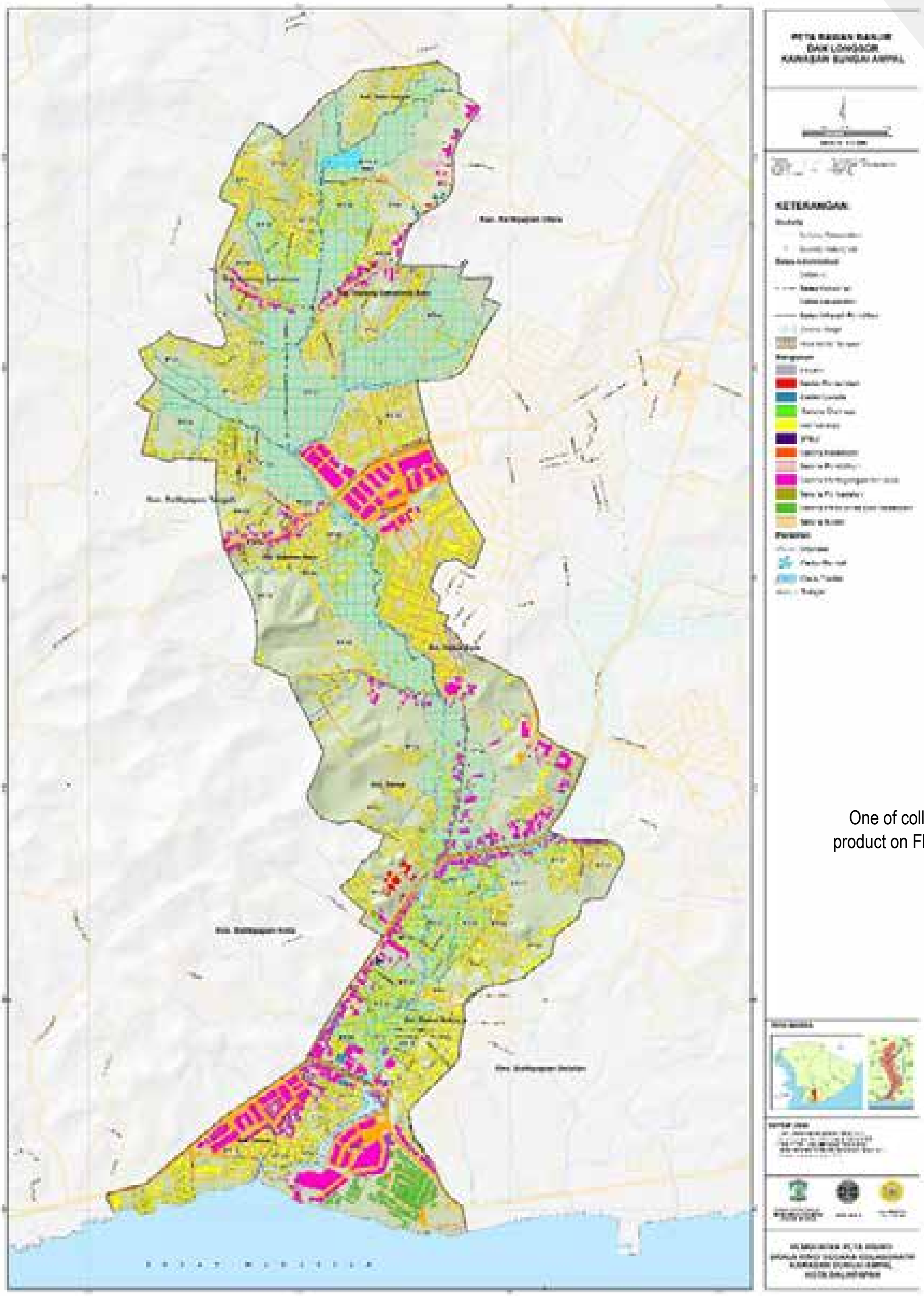


Figure 22

One of collaborative mapping product on Flood and Landslide susceptibility

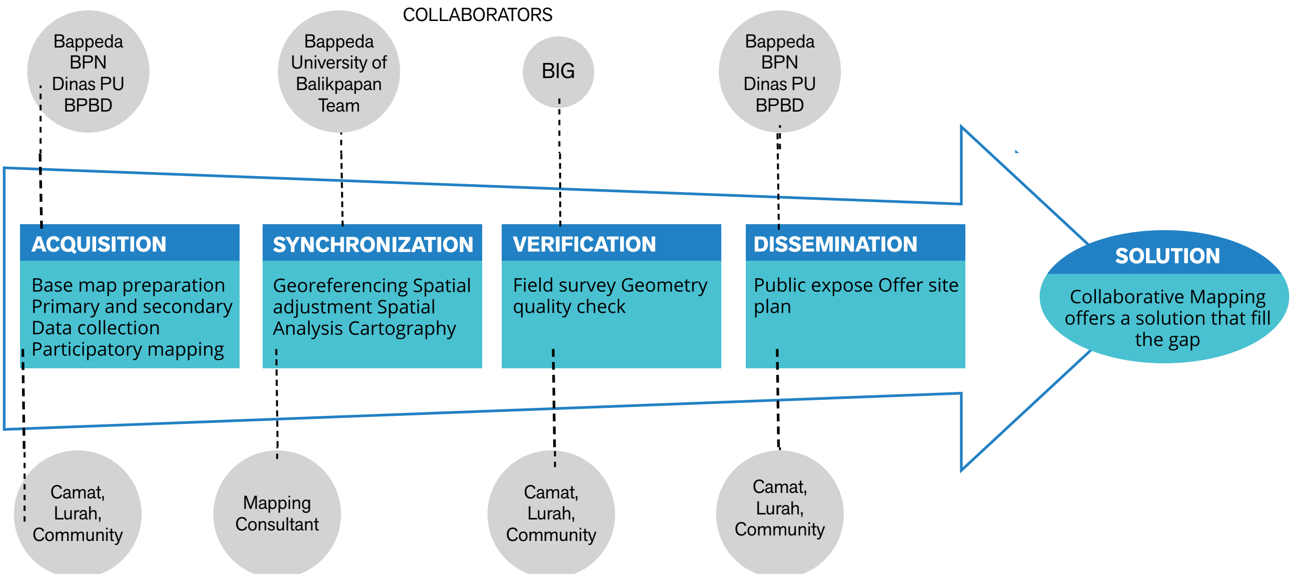


Figure 23

Steps undertaken and parties involved in collaborative mapping process

FLOOD RISK MAP AND LANDSLIDE RISK MAP FOR AREAS AROUND AMPAL RIVER

The detailed risk maps contained information about flood and landslide hazards that had been consulted with experts and community leaders. Risk analysis was generated from the analysis to determine the level of risk based on the hazard and vulnerability.

The analysis of flood-prone areas around Ampal River was done by using community data gathered from participatory mapping activities and analysis of the topographical map. The data used from participatory mapping were mainly information related to extent and intensities of historical flood events. Locations and heights of floods were plotted into collaborative map, and then overlaid with topographical map to delineate flood-prone areas. The analysis of landslide-prone areas was done by using data from the participatory mapping that were overlaid with slope elevation data. The results from the analysis of areas around Ampal River that are prone to flood and landslide hazards were elaborated in the following segments.

Segment 1

Flooding usually occurred due to sea tides, but it only affected a small section of settlement areas. The width of the river was around 30 meter.

Segment 2

Flood-affected area in this segment covered an area of 36.17 Ha with height between 0.5 and 1.5 meter. Flooding was caused by heavy rain and sea tide. Landslide was caused by erosion in the river. The width of the river was 10-18 meter.

Segment 3

Flood-affected area in this segment covered an area of 22.45 Ha. This area was lower than the surrounding streets and hence often inundated with the overflow from Ampal River. Besides rain intensity, narrowing of the river and heavy sedimentation had played a significant role in triggering floods.

Segment 4

Flood-affected area in this segment covered an area of 20.73 Ha from a total of 91.24 Ha. This segment was also prone to landslide due to its steep slope. Flooding in this segment was caused by rain intensity and silting-up of the river due to heavy sedimentation. The width of the river was 8-10 meter.

Segment 5

Flood-affected area in this segment covered an area of 59.04 Ha. This area was the meeting point of three tributaries of Ampal River, and hence the area affected by flooding was quite significant. Flooding was mostly caused by increased intensity of rain, sedimentation, and narrowing of the river in several locations. Also, in several places the river embankments had been broken.

Segment 6

Flood-affected area in this segment covered an area of 32.55 Ha. Flooding occurred during heavy rain with a duration of more than two hours. This was caused by the narrowing of the river that had greatly reduced its capacity to hold the excessive volume of rain water.

Segment 7

lFlood-affected area in this segment covered an area of 8.0 Ha. Flooding was mostly caused by rain intensity and silting up of the river. There was also an area that was prone to landslide in RT 07 of Gunung Samarinda Baru ward.

DESIGN FOR REARRANGEMENT OF AMPAL RIVER'S MODERN MARKET AREA

The proposed design for spatial rearrangement of Ampal River areas took into consideration the technical appropriateness and the economic, social, cultural and environmental feasibility. The recommendations covered issues related to land-use planning, infrastructure planning and spatial zoning.

Ampal River pilot project utilized collaborative map in analyzing the Strength, Weaknesses, Opportunity and Threat of Modern Market development in the form of Design for Spatial Rearrangement of the Segment around Modern Market areas. Some strategic policies had been suggested to be implemented, there are:

a. The realization of one-map policy or decision-making based on the same data and map was needed at city level to ensure the coherence of planning, implementation and maintenance
b. The realization of land acquisition in Modern Market/Fresh Market areas
c. The construction of control dam to contain water flow to the three secondary rivers
d. The follow up to conduct further study of the proposal to develop Fresh Market Areas.

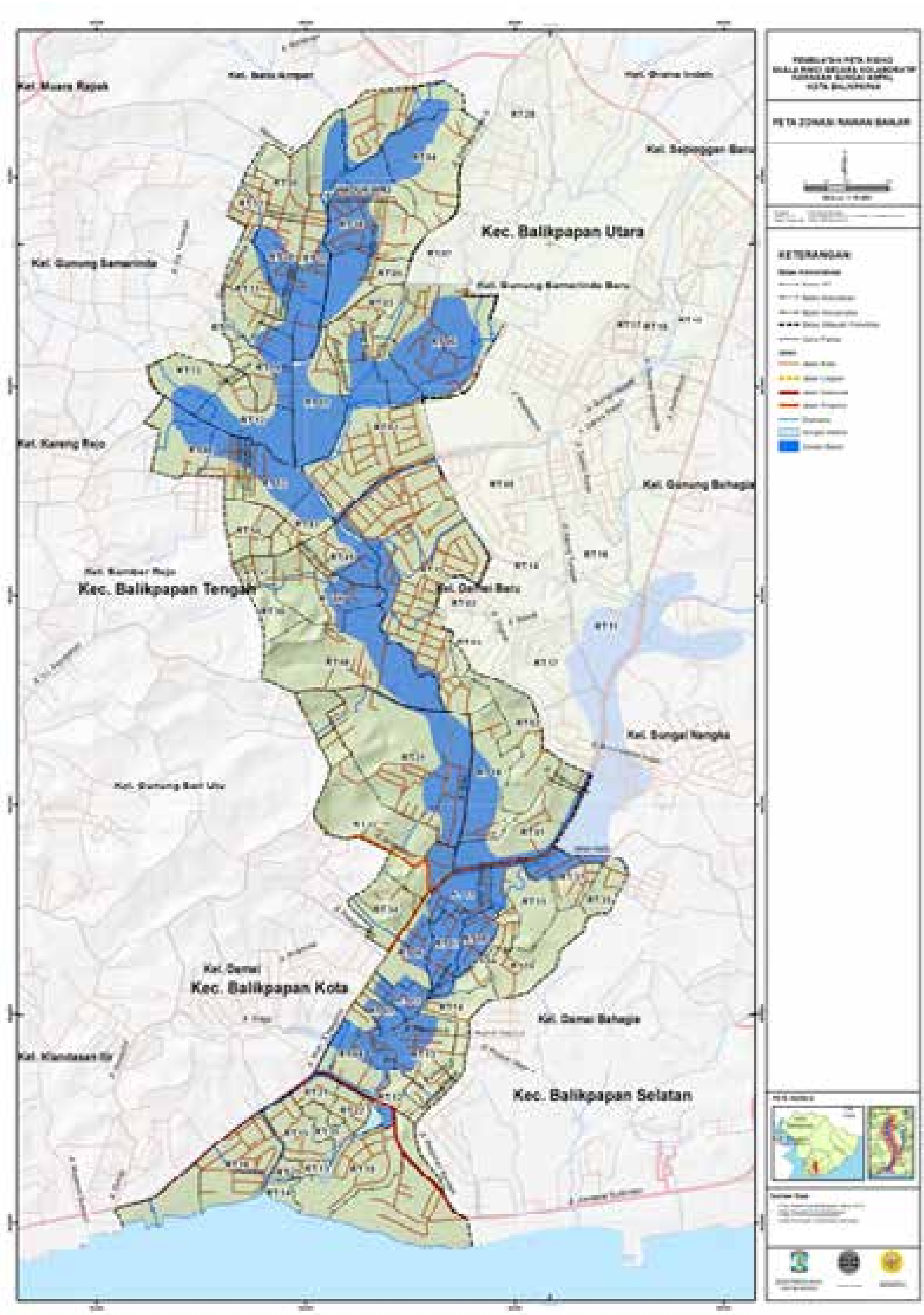


Figure 24

Flood prone areas map

V. Utilization of Collaborative Mapping Projects

From case studies elaborated in Part IV, the overall impression gained at the final workshop on the result dissemination has been the same. The collaborative maps gain positive feedback and interest from stakeholders. Mainly, stakeholders appreciate on the level of detail the map can offer and secondly on the collaborative processes in data collection and validation. Further, the potential uses of the map can be understood very well by stakeholders. As a result, the sense of belonging and ownership of the maps produced grow strong across the involved collaborators and stakeholders.

This part will focus on the use of collaborative maps produced. How the unified data and map produced can be optimally used to support local government needs in urban and rural development. Three post mapping activities will be showcases. First, the utilization of the collaborative map to support the land consolidation in Mount Merapi after the 2010's eruption. Secondly, the utilization of the collaborative map to provide decision-support for risk sensitive urban development in Winongo and Ampal rivers.

VILLAGES	HAMLET	NUMBERS OF	
		LAND PARCELS	SUBJECTS
Umbulharjo	Pangukrejo	468	350
Umbulharjo	Pelemsari	167	121
Kepuharjo	Jambu	292	172
Kepuharjo	Kaliadem	230	173
Kepuharjo	Kopeng	205	154
Kepuharjo	Petung	325	200
Total		1,687	1,170

V. 1. Land Consolidation in Mount Merapi's Post Disaster Recovery

After the Mount Merapi eruption 2010, the local government unleashed a regulation that sub-villages affected directly by the eruption must not be used as settlement areas. This means villagers that live in areas which were burnt or damaged by pyroclastic flow must be relocated to new places. Local government and REKOMPAK then launched a supporting program called community-based settlement planning activities aiming at providing new settlements to impacted residents. Meanwhile the impacted areas defined as zero settlement and building units include land parcels owned by residents.

Land consolidation is a strategy to readjust and rearrange the boundaries of land parcels and their ownerships for improved spatial plan that provide among others better access to settlement infrastructure and better preparedness for a disaster. In case of Mount Merapi, the readjustment and rearrangement were initially to also accommodate needs for evacuation routes, community cattle ranch, local roads and drainages. In Indonesia, land consolidation is a program activity that is done under auspices of BPN and DPPD (BPN 2014). The outcome of the land consolidation program is land certificates to residents in the project area (or new ones for the land parcels that have been certificated). One condition is applied in Merapi land consolidation program which is that the land certificate is an ownership right with type of nonresidential use, such as: farming land. With this certain type of certificates, residents cannot rebuild or add building objects in their land parcels. In total there were 1,687 parcels located at 6 hamlets (known as Dusun) in 2 villages certificated in December 2014 as the result of the land consolidation activity. The land certificates have been handed over to residents who are the subjects of the land parcels in December 2014.

The land consolidation project was done by Yogyakarta Province and Sleman BPN from January to December 2014. The steps undertaken during the project include (Yogyakarta BPN 2014):

- Site identification
- Socialization and community meeting
- Agreement and consensus building
- Site selection
- Subjects and objects identification
- Perimeter and boundaries' measurements
- Topographic and land use mapping
- Parcel-based block plan design
- Community discussion on land boundaries delineation
- Release and land consolidation Boundary Demarcation
- Stake-out survey to apply land consolidation design and agreed land boundaries
- Administration of land tenure process
- Certificates production and hand-over

These steps interact a lot with village officers, community leaders, and land owners. The required activity of topographic and land use mapping was not done since the project agreed to use the collaborative map. The collaborative map resulted from Mt. Merapi's Post Disaster Recovery produced a reference map at scale 1:2,500 depicting topographic layers and thematic information, used as a reference for National Land Office to do land consolidation in the area. In fact, the collaborative map resulted in 2013 was used in many steps to support site identification, subjects and objects identification and to be used as the base map in the process for parcel-based block design. The end result of land parcel map resulted from lnd consolidation project is seen as follow.

Figure 25

The resulted collaborative map of Pangukrejo, Umbulharjo

Figure 26

Using the resulted collaborative map (top), land parcels were identified and their boundaries were designed producing parcel-based block plan design in land consolidation project

From the land consolidation project implementation, it can be concluded that the base map resulted from collaborative mapping activity gave huge contribution not only for its initial purposes for settlement planning and detailed planning activities but also to support land consolidation project need for a detailed yet validated topographic map of project area. Thus, one map can serve many purposes from land administration, spatial planning up to disaster management activities. As the maps were distributed to all stakeholders, village officers and hamlet chiefs could use the collaborative map as a reference for their local references.

V. 2. Spatial Decision-Support in Risk-Sensitive Urban Development

Winongo river in Yogyakarta city and Ampal River in Balikpapan city provide perfect examples about city rivers disturbed by business and settlement areas growth in the city, creating danger and vulnerability to residents living along the river area. It is unfortunate that many settlement areas in the riverbank are prone to flood inundation and landslide events. Ampal dan Winongo projects showcases the potential uses of the collaborative map to produce spatial analysis regarding parcels and buildings to handle to support urban riverbank redevelopment for flood disaster mitigation.

Ampal riverbank area is experiencing fast settlement and business areas grow. Unfortunately the increase of houses and building objects near the river has increased the risk for wider flood inundation and more frequent landslide events (see the figure).

Figure 27

Flood inundation nearby the Ampal riverbank is frequent experience for local residents especially when heavy rain shower the city more than two hours

In fact, the local government has allocated huge budget to revitalize and improve the city drainages to make city areas less vulnerable to flood. This plan however is difficult to be implemented as many land parcels are till in disputes or in uncertain status, thus make the improvement of the city infrastructure becomes difficult. One possible solution for this is the implementation of land consolidation project. Similar to the case of Merapi land consolidation, the site identification for urban land consolidation in Ampal River can be easily developed using the collaborative map produced for Ampal river (see Figure 28).

As for Winongo case, the various technical data collected from technical agencies are valuable data that enable local government to do spatial analysis to implement risk-sensitive urban development in the riverbank areas. To illustrate the utilization of the map, here are some outcomes resulted from spatial analysis done on top of the collaborative map. The following are illustrated usefulness for city planning resulted from spatial analyses done in Winongo Case study.

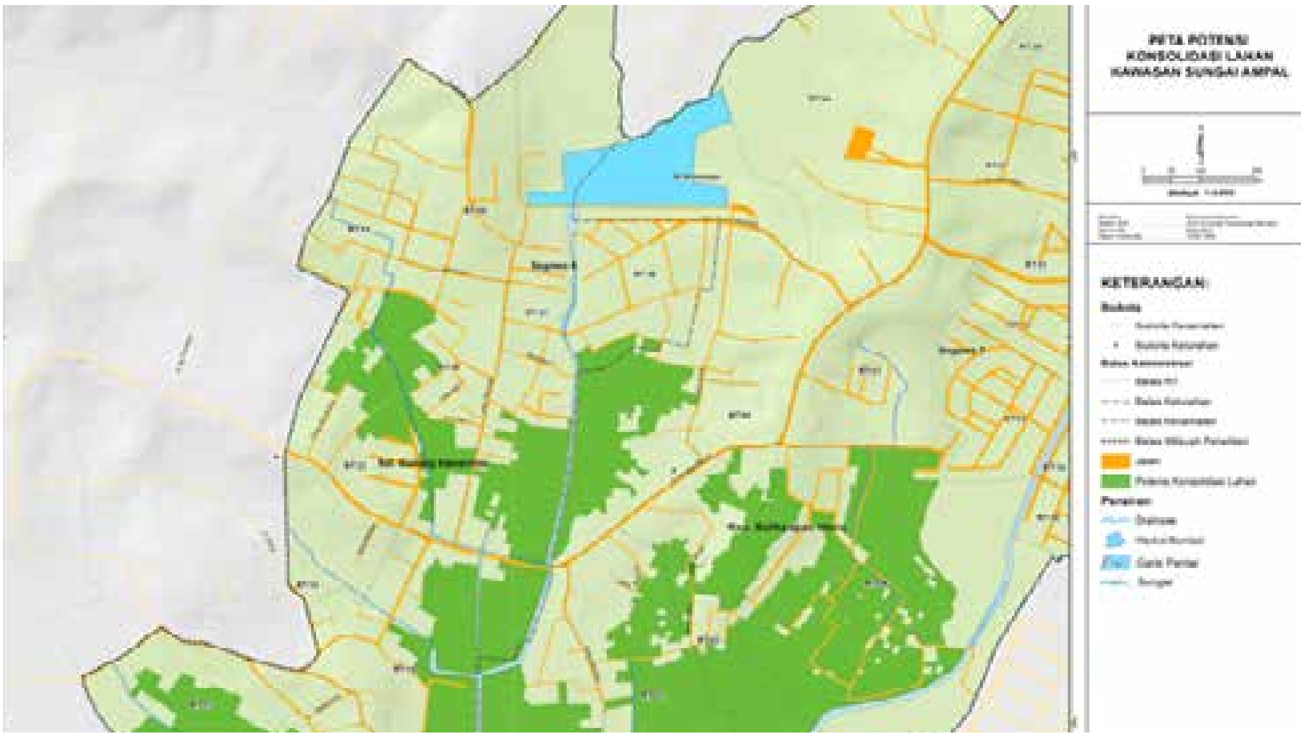


Figure 28

The green aggregated parcel blocks were identified as parcels potential to be included in land consolidation project to support city infrastructure improvement

V. 2. 1. Calculating Building density

Building density in a segment can be calculated by comparing the total area of built environments against the total area of a segment, seen as follow:

$$\textit{Buidling density} = \frac{\textit{total area of built environment}}{\textit{total segment area}} \times 100\%$$

Steps used to calculate building density are :

a. To select building using spatial query (Within) of QGIS spatial query.
b. To calculate building area.
c. To calculate segment/block area.
d. To calculate building density.

Density building is then visualized using heatmap method with radius of determined circle is using the value of individual building area. The results of heatmap visualization of building density for each Segment.

Figure 29

Density buidling heatmap of Segment 1 and 2 (left) as well as 3 and 4 (right) of Winongo River

Figure 30

The demarcation lines of 15 meters right and left from the edge of the river on segment 1 and 2 (left) as well as 3 and 4 (right).

V. 2. 2. Calculating imaginary demarcation lines on riverside areas

The government regulation on River (PP. No. 38/2011) specifies that a city river like Winongo that has depth from 3 up to 20 meters, many are without riverbank structure, should be freed from settlements and has at a free space at least 15 meters from the left and right side of the edge of the river (see Figure 30). Such imaginary demarcation lines on the riverbanks can be seen as an awakening call to simulate how the regulation would affect the riverbank areas.

From the analysis, it can be summarized that hundreds of houses need to be relocated and re-arranged (see Figure 31).

Figure 31

Buildings that virtually are fully within or partially within the 15 m of riverbanks zone

Table

Numbers of buildings that are fully or partially selected in case of urban arrangement based upon riverside zonation (15 m

SCOPE	WITHIN	INTERSECT
Segmen 1	4	67
Segmen 2	80	202
Segmen 3	16	94
Segmen 4	24	124
Segmen 5	42	137
Segmen 6	39	146
Segmen 7	37	126
Segmen 8	21	106
Total (sum)	263	1,002
Total buildings in all segments	263	1,002

Meanwhile the numbers of land parcels that need to be consolidated when urban arrangement will take place is shown in Figure 32.

Figure 32

land parcels (with various riights i.e. use rights/HP, private ownerships/HM, building use rights/HGB) that virtually are fully within or partially within (i.e. intersect) the 15 m of riverbanks zone

V. 2. 3. Identifying the location of waste water treatment infrastructures

The main concern in all segments is that the use of rain drainages is combined with waste water networks. In addition to that, there are some Waste Water Treatment Installation known as IPAL have been built and installed in the field but failed to beused. For this reason, waste water treatment seem essential to be provided in each community area. In this study, the location of IPAL is designed based upon its topographic features of each RW. The results of analysis are presented in Figure 33.

Figure 33

The proposed location of IPAL to be installed in Segment 5 and 6 (left) as well as 7 and 8 (right) based on their access and the topography

V. 2. 4. Identifying where to put hydrant

Optimal hydrants are proposed based upon community inputs and geospatial analysis considering the density of the buildings and accessibility of the local roads in the study area. Optimum hydrant locations were assumed to have a location that no later than 30 meters from the street. The hydrants should be able to reach all settlement blocks. The resulted analysis is shown in Figure 34.

Figure 34

Proposed community hydrant installation in segment 1 and 2 (left) as well as 3 and 4 (right).

V. 2. 5. Calculting best evacuation routes

Optimum evacuation routes were generated utilising tools road planning using GIS software. The destination of the evacuation routes is main public facilities and open space environment.

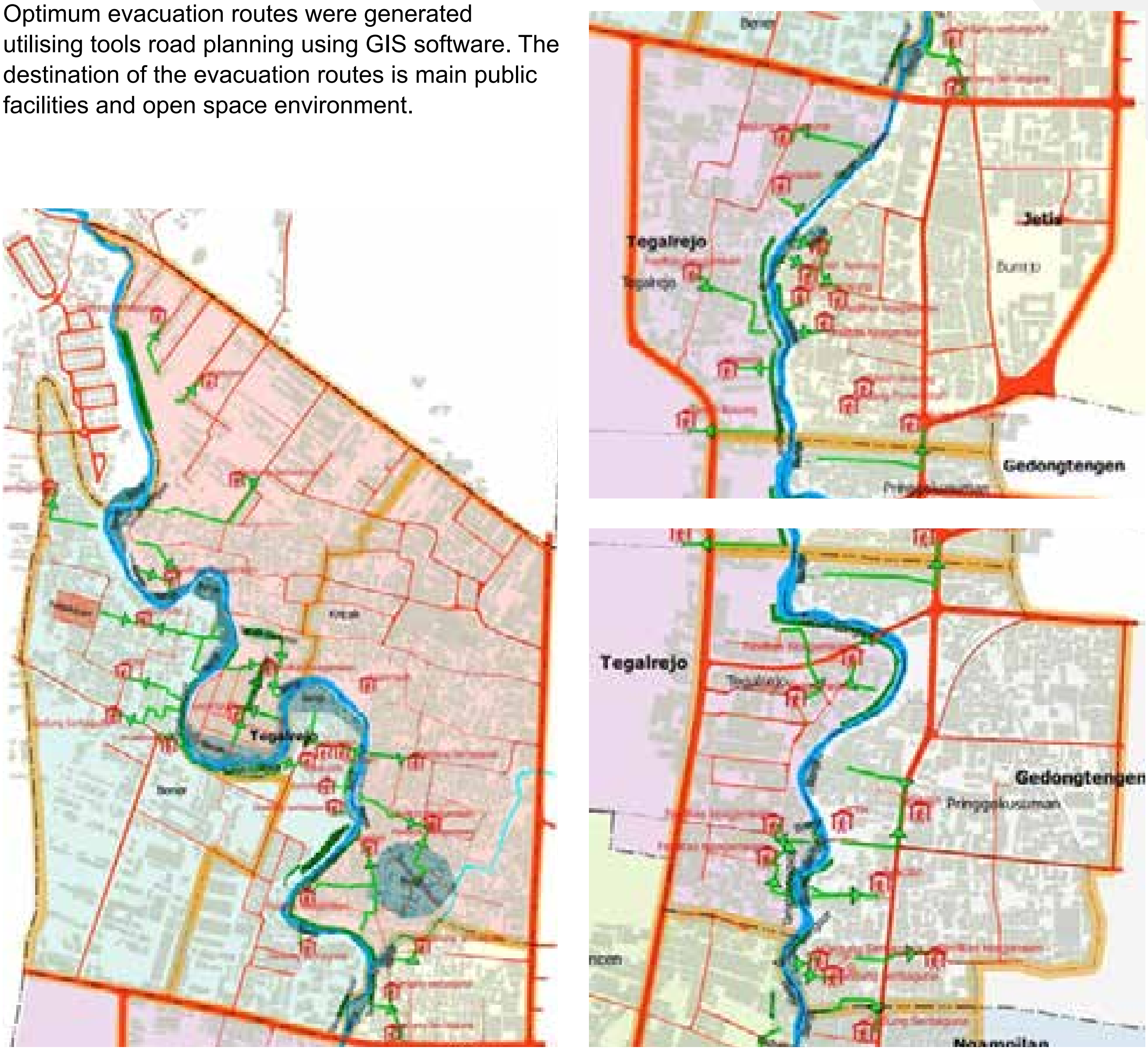


Figure 35

Best evacuation routes for Segments 1 and 2 (left) as well as 3 and 4 (right)

The proposed routes for residents to move from settlements areas to targeted evacuation points in all segments were based upon the existing condition of flood and landslide prone areas. All prone areas were successfully identified based upon historical data gathered during participatory mapping activities and based upon flood discharge estimation from previous study (i.e. Feasibility Study of Winongo River by AECOM 2014). From the map it can then be calculated numbers of buildings either fully or partially threatened by landslide and floods. Figure 36 show the results.

The corresponding numbers of buildings that are constantly threatened by flood events are 431 buildings.

V. 2. 6. Identifying land ownership

In regard to riverbank zonation, the existing condition of land ownership in the study areas shows that major types of rights are private ownerships (*Hak Milik)* and utilization right (*Hak Pakai*), the others are Building Use (*HGB*) and not registered. There are actually many Sultanate Ground land ownerships in the study area but mostly are not registered to BPN. The complete situation of land ownership in the study area can be calculated based upon the collaborative map produced.

Figure 36

Flood extent and threatened houses

Table. Composition of land tenureships based on their right types in the study area

SEG MENT	LAND WITHOUT DEED	PRIVATE OWNERSHIPS (HAK MILIK)	USE (HAK PAKAI)	BUILDING USE (HGB)	LAND WITH NO DEED (%)	HM (%)	HAK PAKAI (%)	HGB (%)
1	2005	1990	54	142	4191	47.84	47.48	1.28
2	1568	2230	46	88	3932	39.87	56.71	1.169
3	517	684	229	61	1491	34.67	45.87	15.36
4	426	625	30	20	1101	38.69	56.76	2.72
5	103	706	120	16	945	10.89	74.70	12.69
6	86	649	134	50	919	9.35	70.62	14.58
7	437	1062	353	59	1911	22.86	55.57	18.47
8	451	824	57	72	1404	32.12	58.69	4.06

In order to illustrate the composition of the land ownerships as presented in Figure 37 shows the situation of land tenureships surrounding the Winongo river. The types of ownerships can be not registered (*belum terdaftar*), private ownership (*hak milik*), building use (*hak guna bangunan*), use right (*hak pakai*).

Figure 37

Land ownership situation in Winongo river

VI. Lesson Learned

From the showcases on the development of collaborative maps (Chapter IV) and their usefulness the lessons learned on advantages and challenges of collaborative mapping projects can be identified. These lessons learnt are expected to create awareness and comprehension to assess opportunities in applying collaborative mapping projects for supporting detailed spatial planning and risk zonation for disaster management.

VI. 1. Advantages

VI. 1. 1. EFFICIENT WAY TO GATHER GOOD QUALITY DATA

A significant advantage of this approach is that it offers lower budget and shorter time of actions than conventional mapping approaches. Government and local government mapping projects require more budget to hire experts and professionals that are not from the area. Using conventional implementation, consultants need more time to get to know the local area and more resources to mobilize the team, whereas in the collaborative mapping approach, the consultants are the community, local leaders, village officers, technical agency leaders and staff with scientist and students are installed as facilitators. Merapi project that required 4 months of actions spent about 330 millions rupiah or 110 million rupiah for each village, Winongo project that covered about 500 ha of corridor mapping areas spent about 250 million rupiah or 700 thousand rupiah per ha to get complete geospatial features of contours, building footprints, neighbourhood infrastructures, hazard areas, etc. In summary, the advantages of the mapping approach include:

- It offers faster and cost efficiently map products
- It offers better ownership values to stakeholders

VI. 1. 2. STRENGTHENING SPATIAL AWARENESS

In addition to the rapidness to derive the outcome and the reduced cost for data acquisition, the outcome of the collaborative mapping creates a better ownership to stakeholders involved in the process. Through participatory mapping activities at the community level and stakeholders meeting involved local agencies, data sharing and data validation become more familiar to stakeholders. Good quality product can be offered as it requires the quality assurance from BPN and the level of detailed of the content is validated by all parties.

In participatory mapping sessions and stakeholder workshop, environmental problems related disaster and their proposed solutions are expressed and documented in the draft map. It combines top-down and bottom approaches, so more than just participatory mapping activities. In this regard, community and local staff become more familiar with maps and geospatial information on their niche.

The resulting map is, at the same time, an effective tool for program planning and monitoring. First, once the problems and drawbacks are all spatially represented and documented, local community used the map as a base to propose community-based plans to be submitted to sub district office. From the government perspective, those spatially referenced problems and drawbacks will be straightforward resources to develop priority actions. Interestingly, the current planning system endorse bottom-up planning programs.

Monitoring and evaluation on land developments and permit issuance could be very effective to be done on top of the collaborative map. The challenge will be on the institution support and resource allocation to make sure that the useful information resources gained from the collaborative map is used for planning and decision-support. Here are the opportunities it can offer:

- Basis for well targetted public investments, regulate land use, and increase resiliency
- Unlimited themes: high adaptability and interoperability
- System and data base integration by vertical and horizontal

VI. 1. 3. EXTENDING POSSIBILITIES AND OUTREACH

The collaborative map can also be easily turned into a “living spatial canvas” to present field developments’ updates and to gather community feedback. The Web 2.0 technology has opened up possibilities to mash up the web collaborative map (WebGIS) with social media as a crowd application, even to be accessed through Mobile Apps. This has been exemplified by many smartcity applications (e.g. QLUE in Jakarta) where human sensors are employed to support city services’ improvement. Connecting the web collaborative map application with field sensors and human sensors is a huge potential to offer.

VI. 2. Real challenges

It must be acknowledged, that the challenges to produce a collaborative map of an area are difficult and complex. Not only on the data availability, quality, but also on the heterogeneity of the data format. Here is the summary:

ITEMS	CHALLENGE	RESPONSE
Base Map	Availability of physical and digital map of national standard	Practical regulation to accelerate base map generation
Data source	Not spatially adjusted format, out of date, low resolution, misplaced, confidentiality	Triangulation with primary data, build consensus and understanding
Thematic model	Lack of guidance about thematic data model on attributes taken into account include layer, class and category	Sectors to decide and prepare guideline for each and every thematic map
Data sharing	Disconnection of local and national data management	Introduce platform of national data management
Human resource	Varied capacity of local consultants	Promote training, advisory, knowledge sharing and networking with national pool of talents

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Abbreviations & Acronyms

BPBD DIY	Yogyakarta Provincial Disaster Management Agency
BAPPEDA	Badan Perencanaan Pembangunan Daerah/Regional Development Planning Agency
BBWS	Balai Besar Wilayah Sungai/River Basin Development Agency
BIG	Badan Informasi Geospasial/Geospatial Information Agency
BNPB	Badan Nasional Penanggulangan Bencana/National Disaster Management Authority
BPN	Badan Pertanahan Nasional /National Land Agency
BPN	Badan Pertanahan Nasional/National Land Agency
BPPTK	Badan Pengkajian dan Pengembangan Kegunungapian /Agency for Technological Development and Research of Volcanology
BPPTKG	Balai Penyelidikan dan Pengembangan Teknologi Kebencanaan Geologi/Research and Technology Development of Geological Disaster
DED	Detailed Engineering Design
DEM	Digital Elevation Model
DIY	Daerah Istimewa Yogyakarta/Yogyakarta Special Region
DPPD	Dinas Pengendalian Pertanahan Daerah/Regional Land Control Department
DRM	Disaster Risk Management
FKWA	Forum Komunikasi Winongo Asri/Winongo Community
GCP	Ground Control Points
GFDRR	Global Facility for Disaster Reduction and Recovery
GIS	Geographic Information Systems
GPS	Global Positioning Systems
IPAL	Instalasi Pengolahan Air Limbah/Waste Water Treatment Installation
LAPAN	Lembaga Penerbangan dan Antariksa Nasional/National Institute of Aeronautics and Space
PPK GPS	Post Processing Kinematic GPS
PU	Pekerjaan Umum/Public Works
PU ESDM	Pekerjaan Umum, Energi dan Sumber Daya Mineral/Public Works, Energy and Natural Resources Agency
PVMBG	Pusat Vulkanologi dan Mitigasi Bencana Geologi/Center of Volcanology and Disaster Mitigation
RDTR	Rencana Detail Tata Ruang/Detailed Spatial Plan
REKOMPAK	Rehabilitasi dan Rekonstruksi Berbasis Masyarakat/Community-based Settlement Rehabilitation and Reconstruction
RT and RW	Rukun Tetangga and Rukun Warga/Neighborhood areas
UAV	Unmanned Aerial Vehicle

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Global Facility for Disaster Reduction and Recovery

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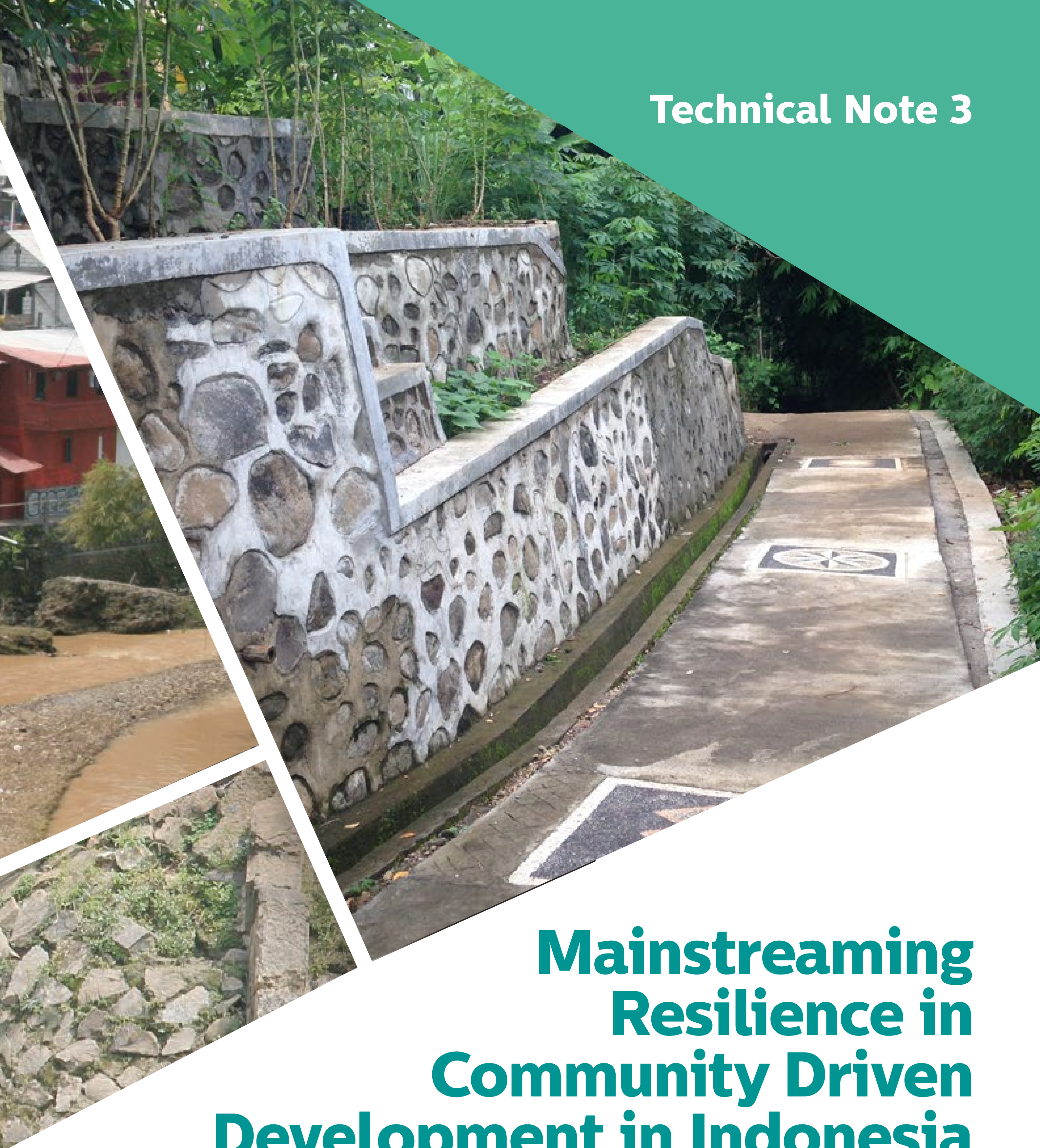

Mainstreaming Resilience in Community Driven Development in Indonesia

WORLD BANK GROUP

GFDRR
Global Facility for Disaster Reduction and Recovery

Mainstreaming Resilience in CDD Project in Indonesia

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Content

Abbreviations & Acronyms

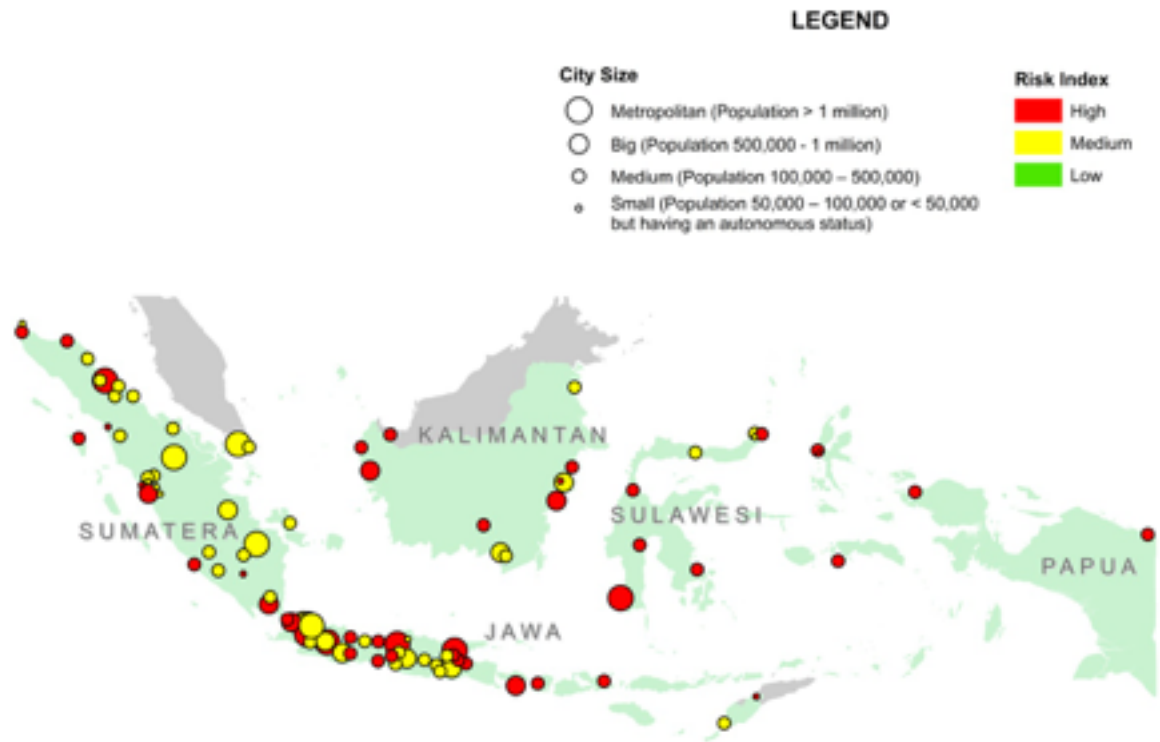
AB	Aturan Bersama /Community Rules
BAPPEDA	Badan Perencanaan Pembangunan Daerah/Local Development Planning Board
BIG	Badan Informasi Geospasial/Geospatial Information Agency
BKM	Badan Keswadayaan Masyarakat/community-elected Board of Trustees
BMKG	Badan Meteorologi, Klimatologi, dan Geofisika/ Agency for Meteorology, Climatology, and Geophysics
BNPB	Badan Nasional Penanggulangan Bencana/National Disaster Management Authority
BPBD	Badan Penanggulangan Bencana Daerah/Local Disaster Management Agency
BPS	Badan Pusat Statistik/National Statistical Agency
CBDRM	Community-based disaster risk management
CDD	Community Driven Development
CDP	Community Development Plan
CSS	Community Self-Survey
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
GFDRR	Global Facility for Disaster Reduction and Recovery
KSM	Kelompok Swadaya Masyarakat/
LKM	Lembaga Keswadayaan Masyarakat/community-elected Board of Trustees
MIS	Management Information System
ND	Neighborhood Development
NMC	National Management Consultant
OM	Operations and Maintenance
Perda	Peraturan Daerah/ Local Government Regulation
PMU	Project Management Unit
PNPM	Program Nasional Pemberdayaan Masyarakat/National Community Empowerment Program
PRBBK	Pengurangan Risiko Bencana Berbasis Komunitas/ Community based Disaster Risk Reduction
PU	Pekerjaan Umum/Public Works
RPJMN	Rencana Pembangunan Jangka Menengah Nasional/National Medium Term Development Plan
TAPP	Tim Ahli Perencanaan dan Pemasaran / Community Urban Planner
TIPP	Tim Inti Perencanaan Partisipatif/ Community Participatory Planning Core Team
UPP	Urban Poverty Project

Chapter 1
INTRODUCTION

Indonesia is an archipelagic country that lies between three main tectonic plates, Eurasian, Pacific and Indian-Australian plates, and is part of the Pacific Ring of fire. The country has more than 17,000 islands[1] and constitutes the biggest archipelagic country in the world. Indonesia has 34 provinces, 416 districts, 98 cities, 7,024 sub-districts, and 81,626 villages/urban wards. According to official statistics, in 2015 the total number of Indonesian population reached 255.5 million and 57% of the population live in the island of Java. Despite the abundant natural resources, fertile land, rich biodiversity and scenic landscapes, this chain of islands are highly prone to natural disasters. Indonesia is also highly urbanizing where the urban population is currently accounts for 54% and it is expected to reach 67% by 2025, and there are currently 98 municipalities in the country. Figure 1 below illustrates the distribution of disaster risks among Indonesian cities.

Due to this rapid urbanization, many cities in Indonesia face the problem of land scarcity. While population in urban areas continues to grow rapidly, land availability tends to be stagnant, and the needs for land areas for housing and settlements cannot be met. Many city dwellers cannot afford to buy land or livable houses because their prices keep increasing in-line with the inflation. Lower income population often have no options other than residing in informal settlement areas, which are frequently also unsafe, such as in riverbanks, unstable slopes and other hazard-prone zones. These settlements gradually grow into densely-populated areas.

Distribution of Disaster Risks in Indonesian Cities



Source: World Bank analysis, 2016

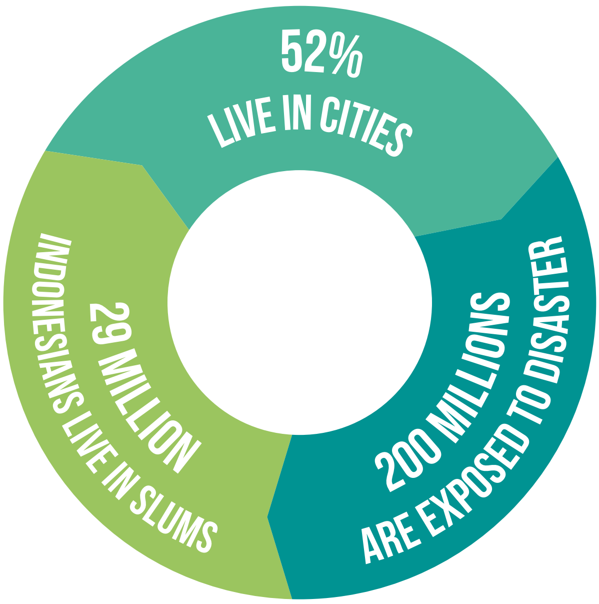
[1] Based on data from the Geospatial Information Agency (BIG)

Figure 1. Flooding in densely populated areas in big cities

The Indonesian Disaster Risk Index issued by BNPB (National Disaster Management Authority) in 2013 groups 136 districts/cities in Indonesia within the category of high risk. The risk has been assessed based on the probability of impacts occurring should a hazard event turns disastrous. During 2000-2015, 82% of disaster in Indonesia is categorized as prone to hydrometeorology type of hazards, such as flood, strong wind/typhoon, landslide, drought, and forest fire.

Disasters can wipe away years of development gains in a matter of minutes or hours. Disaster events that often occur in areas with high population density in big cities in Indonesia include urban fires, floods, and strong winds. The capacity of the people in coping with these disasters tend to be very low due to their limited awareness and knowledge.

Indonesia Urban Poor Community that is exposed to disaster



Source: World Bank, BNPB, 2016

[2] "Experiences in Building Resilient Communities" (Pengalaman Membangun Masyarakat Tangguh), BNPB, 2013

Disasters may cause economics slow down, increase poverty and unemployment. The poor are disproportionately exposed and have to bear the brunt of disaster impacts. Disaster events also affect public service delivery such as health, food security, water and sanitation, and livelihood, which may further harm people living in poverty. There needs to be capacity building to build the resilience of the community to disasters, particularly the poor who tend to be concentrated in urban areas.

Building Resilience according to 2014 BNPB[2] has to be characterized at least by the following traits: 1) capacity to anticipate hazards; 2) capacity to absorb or eliminate shocks by countering or adapting to them; 3) capacity to manage or maintain certain basic functions and structures in times of disaster emergency, and 4) capacity to recover or bounce back in the aftermath of a disaster event. Efforts to build community resilience need to be focused on the empowerment of community's roles in reducing the risks they are facing.

Figure 2. Living environment in densely-populated areas in typical Indonesian cities

Chapter 2

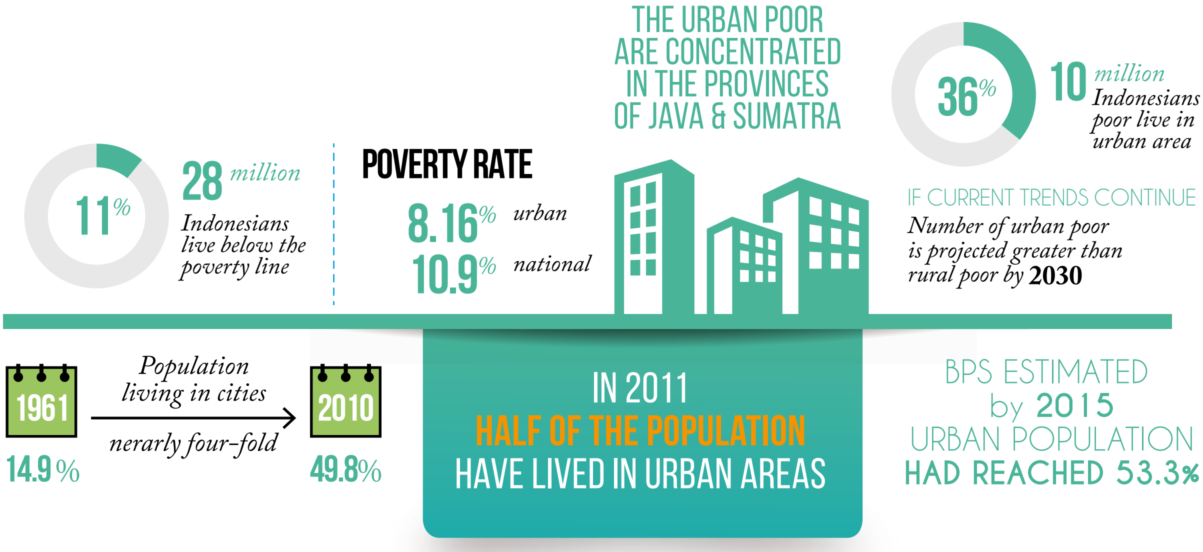
ISSUES AND GAPS IN COMMUNITY RESILIENCE

Indonesia ranked among the top ten fastest urbanizing countries of the world during 1990-2014 and has the second-largest urban population in East Asia after China.

In 2014, more than 28 million Indonesians live below the poverty line, or approximately almost 11% of total population. According to the National Statistical Agency (BPS), the urban poverty rate was 8.16% in 2014, compared to the national poverty rate of 10.9%. World Bank estimates indicate that 36% of the poor in Indonesia live in urban areas (over 10 million people), and the number of urban poor is projected to be greater than that of rural poor by 2030, if current trends continue. The urban poor are concentrated in the provinces of Java and Sumatra. The percentage of population living in cities has increased nearly four-fold since 1961, from 14.9% to 49.8% in 2010. In 2011 the population in Indonesia has become an urban population because more than half of the population have lived in urban areas. BPS estimated that by 2015 urban population in Indonesia had reached 53.3%.

Source: World Bank, BNPB, 2016

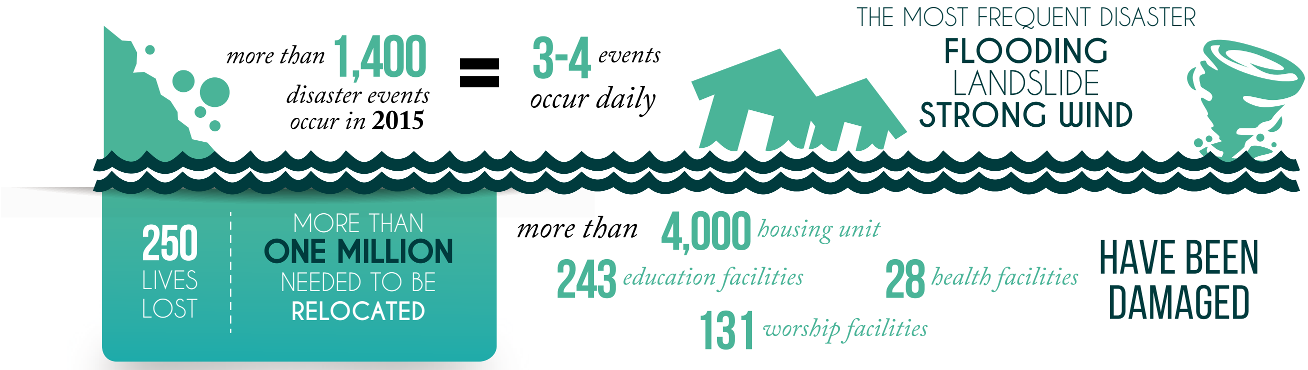
Figure 3. Road infrastructures that are not well built



Source: World Bank, BNPB, 2016

According to BNPB's data, in the past two decades, disaster mostly hit Java, Sumatra, Sulawesi, Bali, and Nusa Tenggara where most population is concentrated. The increase in urban population and natural hazard potentials has greatly increased community vulnerability. Non-disaster resistant infrastructures, unfavorable social-economic condition, and poor environmental management have also increased the vulnerability and exposure of urban population. The distribution of disaster events in Indonesia has also been increasing due to climate change. The local governments, which are at the forefront in facing disasters, have

Figure 4. Settlements wiped out by landslide in Banjarnegara District, Central Java



Source: World Bank, BNPB, 2016

mostly been unprepared in managing disaster risks, such that disaster casualties and economic losses and damages continue to be substantial.

Experiences from major disasters in Indonesia such as Aceh tsunami (2004), Yogyakarta earthquake (2006), Padang earthquake (2009), Jakarta floods (2013) have shown that the most affected sectors are housing and public facility. It means that this infrastructure has not been built with sufficient disaster-resistant fund. Disaster damage and loss data have demonstrated that housing infrastructures and public facilities and infrastructures in the country have not been made disaster-resistant. According to BNPB, more than 1,400 disaster events occur in 2015 alone, meaning that between 3-4 events occur daily. The most frequent disasters include flooding, landslide and strong wind. The direct impacts of these disasters include 250 lives lost and more than one million people needed to be relocated. More than 4,000 housing units have been destroyed, and 243 units of education facilities, 131 worship facilities and 28 health facilities have also been damaged. In the last 2 decades, the impacts of disaster on human settlements have increased significantly particularly in urban areas.

Figure 5. Flood-prone riverbank areas

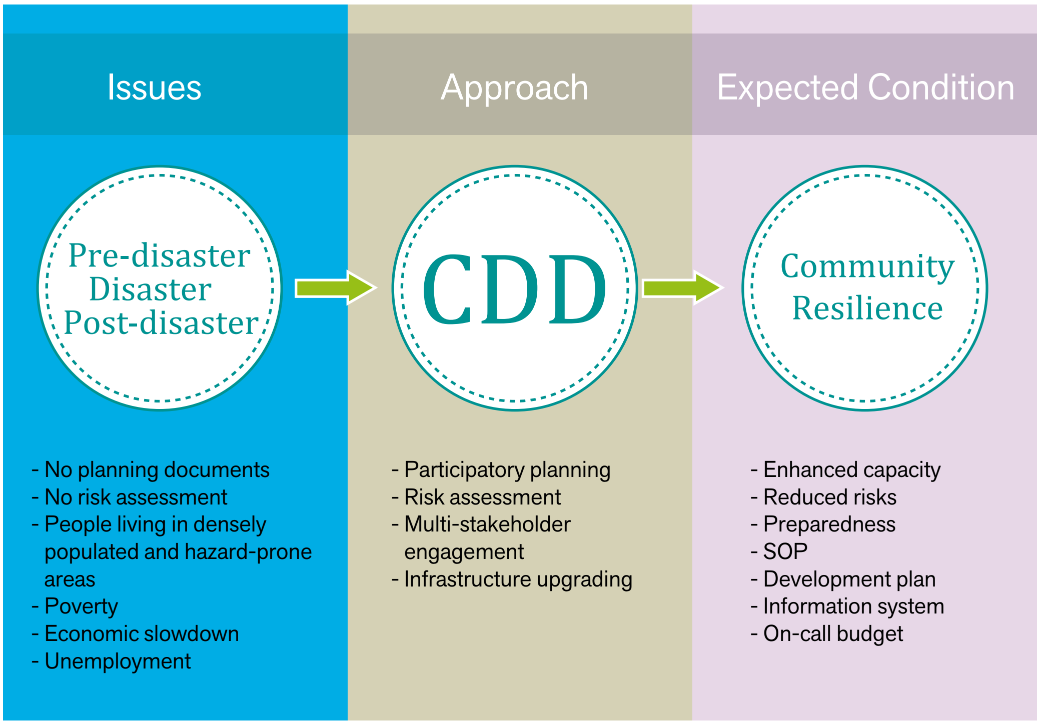
Urban congestion and disaster risks (e.g. flooding) are restricting growth in Indonesian cities, leaving many Indonesians vulnerable to natural and man-made hazard risks. In Jakarta, congestion is estimated to cost more than US$3 billion annually and flooding affected 17.1% of the metropolitan area in 2014. One week of flood in Jakarta in 2013 alone, for instance, cost more than IDR 7.5 trillion (USD 750 million).

Although resilience including in urban development has now been mainstreamed in the National Medium Term Development Plan (RPJMN) for 2015-2019, commitment to concrete targets is yet determined at the local level. Such commitment needs to be supported by resources to invest in resilience and strengthening capacity development at the local level. Disaster risk management also has not been considered as a shared responsibility of different development stakeholders. The national government has most of the time been considered as the only entities that should bear the responsibilities in dealing with the adverse impacts of disaster. As communities are at the forefront in dealing with disaster, efforts to reduce risks should be focused on the communities, particularly through community-based awareness, capacity building and structural measures to reduce, prevent or eliminate disaster risks.

At the village/urban ward level, planning documents are often not prepared in a participatory manner and are not sensitive to disaster and climate risks. Urban settlement and land use planning and development are not built resilient to earthquake, flooding, landslide, and taking into account all the existing and projected risks. In building community resilience, development is yet to be planned as comprehensive and integrated that includes physical (infrastructures and housing), and social and economic elements that empower the people. Awareness of the community to disaster remains weak and government apparatus at the village level still needs to build closer networking with planners, local disaster agencies (BPBDs), and other relevant development actors.

There is also major data gap in terms of official data in disaster risk analysis, as the local governments seldom has the resources and capacity to engage the communities in such exercise. In the past, village level plan was often formulated without involving local government units such as the Local Development Planning Board/Bappeda, Public Works Office and other sectoral units that can actually provide disaster-related data, and information about hazard-prone areas, local bylaws related to disaster mitigation, and early warning system.

To overcome the issues and gaps, communities need to be empowered through a community-based programs to build their disaster resilience. The Community Driven Development (CDD) approach can become an entry point for community-based disaster risk management that may include risk assessment, disaster risk management planning, capacity building and concrete structural measures. The engagement of the communities through the CDD process may help reduce their vulnerability and at the same time build their resilience.



Scheme for mainstreaming CDD in building community resilience

Community-driven development is an approach "… that gives control over planning decisions and investment resources to community groups and local governments." Historically, programs using a CDD approach grew out of situations of crisis (financial shock, conflict, and even natural disasters) and were meant as transitional instruments for service delivery where governments (particularly newly installed administrations) lacked capacity to deliver services (Wong 2012). By optimizing the use of community actors, a CDD approach places less stress on government line agencies and at the same time is able to reach very large numbers of poor people. A CDD approach has traditionally been used by Social Funds, which are government agencies or programs that channel grants to communities for small-scale development projects. Social Funds typically finance a mixture of socioeconomic infrastructure (e.g., building or rehabilitating schools, water supply systems, and roads), productive investments (e.g., microfinance and income-generating projects), social services (e.g., supporting nutrition campaigns, literacy programs, youth training, and support to the elderly and disabled), or capacity-building programs (e.g., training for civil and local governments) (World Bank 2009).

Source: Arnold, Margaret, Robin Mearns, Kaori Oshima, and Vivek Prasad. 2014. "Climate and Disaster Resilience: The Role for Community-Driven Development." Social Development Department. World Bank, Washington, DC.

Chapter 3

COMMUNITY DRIVEN DEVELOPMENT AS ENTRY POINT

Building Resilience from the Community

A number of catastrophic events, from the Indian Ocean Tsunami in December 2004 to the Yogyakarta Earthquake in May 2006, have become a turning point for the Government of Indonesia in reforming its national disaster management system. Throughout the response and recovery phases of these disasters, the role of community as the first responder and main development actor was very evident.

The Government of Indonesia has established a national platform for community empowerment called the National Community Empowerment Program (*Program Nasional Pemberdayaan Masyarakat* or PNPM). To date the program has covered more than 60,000 villages (through PNPM Rural) and 11,000 urban wards (through PNPM Urban). This leading Community-driven Development (CDD) program for poverty reduction[3] in urban areas has been operational since 1999, previously under the name of Urban Poverty Project (UPP)[4]. In its original design, however, the UPP had not focused its interventions on ex ante disaster risk reduction, but the program has effectively been used as a platform for ex post village post-disaster recovery, preparedness building and resilience programs in disaster-affected areas where the program operated such as in Aceh, Yogyakarta and Central Java, and West Sumatra.

With the enactment of Law Number 24/2007 on Disaster Management, the government has not only declared its responsibilities to protect

Figure 6. A house in settlement area in northern Semarang city facing constant land subsidence

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[3] PNPM Urban has evolved from poverty reduction-focused to improvement of basic infrastructure and services. It is one of the largest CDD projects in the world, as stated in the "Indonesia: Evaluation of the Community Driven Development Program", 2013

[4] PNPM Urban itself was effective in 2007, scaling up from UPP. In the beginning, UPP covered only 5 provinces, focusing in Java Island. PNPM Urban expanded the coverage of the program to 33 provinces.

all citizens from disaster impacts, but also the rights of the people to obtain education, training, and capacity building in disaster management. The law also promotes participation of the communities in decision making in disaster management, particularly related to programs and activities that may affect their resilience. Under this law, every citizen is now obliged to engage in disaster management activities. In 2008 the government established the National Disaster Management Authority/BNPB, which has the mandate to command, coordinate and implement an integrated disaster management system, and which reports directly to the President. The Disaster Management Law decentralizes disaster management to the provincial and municipal government levels, and it mandates provinces and districts/cities to establish a local disaster management agency/ BPBD. This new policy and legal framework on DRM is in fact consistent with community driven approach of PNPM.

As many community-based disaster risk management (CBDRM) initiatives have been developed and implemented by both government and non-government entities, BNPB launched an umbrella program for CBDRM known as the Resilient Village/ Urban Ward program through Chief of BNPB Regulation No. 1/2012. The regulation defines a number of indicators as a point of reference for any villages that want to build its resilience. The indicators consist of six aspects, i.e. legislation, planning, institutional, financial, capacity building, and disaster management activities. The program to build resilient village was initially piloted in 42 villages in 21 provinces. Some other ministries and agencies implement similar programs, for instance the Ministry of Social Affairs with its *Kampung Siaga Bencana* (Disaster Prepared Village), and the Ministry of Health with its *Desa Siaga* (Ready/ Prepared Village). There are quite a number of such village-based programs, but the activities were yet to link their risk assessment, DRM-mainstreamed planning, and structural and non-structural measures.

Figure 7. A slum settlement in Makassar.

Figure 8. Tsunami Evacuation Route, Disabled-Friendly Design.

Building on the lessons learned and experiences from program implementation in disaster-affected areas, PNPM Urban can provide a promising platform to address one point at the Sendai Framework for Disaster Risk Reduction 2015-2030, that within the context of sustainable development and poverty eradication, there is a need to integrate disaster risk reduction into policies, programs, planning, and budgeting at all levels, as well as to invest disaster risk reduction through structural and non-structural measures. With the emerging urgency of mainstreaming disaster risk management into development down to the grassroots level, PNPM Urban initiated to incorporate disaster risk reduction components into its programming, taking advantage of its established CDD networks and mechanism.

PNPM Urban: A Promising National Platform for Mainstreaming Resilience in CDD

PNPM Urban covers all urban wards in Indonesia and lays the foundation for community participation in planning, decision making, and the mechanism to channel and manage funds at *kelurahan*[5] level. Program management at the community level is led by a community-elected Board of Trustees called BKM/LKM (*Badan/ Lembaga Keswadayaan Masyarakat)*. The program allocates *kelurahan* grant to facilitate local institutional development, capacity building, technical assistance, formulation of the Community Development Plan (CDP), and a stimulant funding for poverty reduction investments as defined in the CDP. The type of investments to alleviate poverty may include infrastructure, social, and economic projects. Employing a participatory approach, community members would first set a vision of their communities, and accordingly identify issues and strengths of their areas in relations to their poverty situation. Subsequent to that, they will analyze the actual needs to improve their living conditions, formulate and implement a plan to change those conditions. The program is managed by a Project Management Unit (PMU), which is established under the Ministry of Public Works as the executing agency. Technical assistance is provided by the National Management Consultant (NMC), regional and provincial consultant teams, city coordinator teams, and assisted by more than 6,000 facilitators.

[5] Kelurahan is an administrative term for urban wards. A city would consist of several sub-district, and each sub-district consists of several *kelurahan*s.

PNPM Urban has been a dynamic program that involves intensive learning processes at all levels, from the national down to the community levels. In the initial design, the UPP's objectives were: (1) to improve basic infrastructure in poor urban neighborhoods; (2) to promote sustainable income generation for its poor urban residents who are mostly long-term poor, have incomes eroded by high inflation, or lost sources of income in the economic downturn; and (3) to strengthen the capability of local agencies to assist poor communities, all to be done through a bottom-up and transparent approach. Feedbacks and lessons learned obtained from regular monitoring and evaluation were processed and shared for the constant improvement of the program. Later the objectives shifted, aiming a better partnership between communities and local governments, and introducing DRM measures to the program, i.e. to ensure that the urban poor in participating *kelurahan* benefit from improved local governance and living conditions that will be achieved through: (1) strengthening and institutionalization of elected representative organizations or BKM (*Badan Keswadayaan Masyarakat*) at *kelurahan* level that are accountable to the communities, (2) provision of direct block grants to communities to finance poverty reduction activities; (3) enhancement of the capacity of the central and local governments to partner with community organizations in public service delivery, and (4) increasing DRM awareness of disaster risk management and mainstreaming DRM to strengthen resilience.

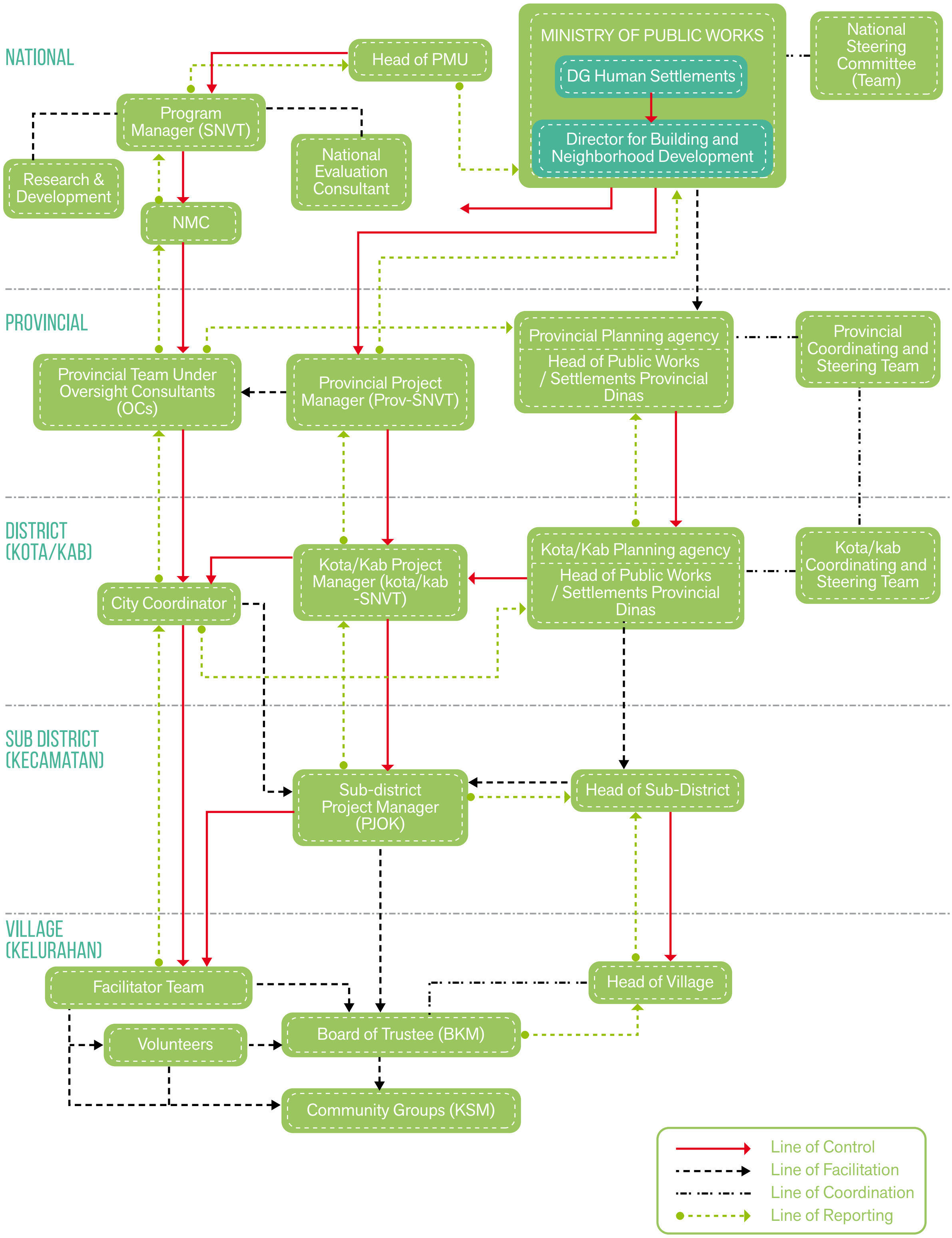
Figure 9. An example of transformation made by PNPM Urban ND in a formerly slum area in Yogyakarta.

Several pilot projects to enhance the national platform have been conducted, embedded with PNPM Urban program, locations, and BKMs. One of them is the Neighborhood Development (ND) program, an 'advanced' version of PNPM Urban. In each *kelurahan* that implements PNPM-ND, the Community Development Plan formulated earlier through PNPM Urban will be refined with the introduction of spatial analysis and plan to create an orderly, safe and healthy neighborhood. The principles of PNPM-ND include comprehensive and spatial-oriented planning, active involvement of local governments, being creative and innovative, and good governance. PNPM-ND began as a pilot initiative in 2008 and to-date it has been expanded to cover more than 700 urban wards across the country.

The program has been growing and lately it has stronger involvement of local governments and is focused more on slum areas. PNPM-ND provided lessons that resilience measures need to be introduced in the design of the program, since there are many part of PNPM-ND cities, particularly slums, are located in disaster prone zones such as those on the coastal area and riverbanks, making the cities more vulnerable to disasters. Based on these needs, a pilot project which introduces DRM measures into PNPM Urban by adopting PNPM-ND cycle, named PNPM Urban – CBDRM, had been initiated. The pilot project would be a learning base before the introduction of a comprehensive effort to mainstream resilience into the PNPM Urban national platform.

Figure 10. Road built by the community along with the landslide mitigation.

Project Organization of PNPM Urban (Project Appraisal Document for the National Community Empowerment Program in Urban Areas for 2012-2015, 2015)



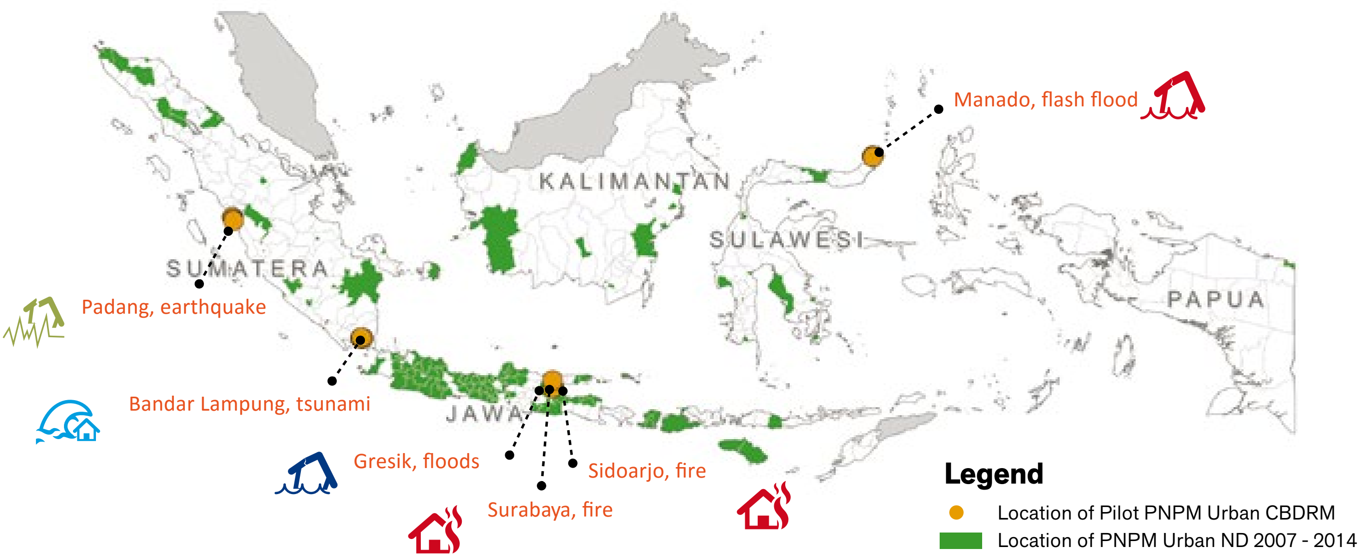
Chapter 4
MAINSTREAMING OF RESILIENCE INTO PNPM URBAN

Pilot initiatives on mainstreaming resilience into development through PNPM Urban platform, known as CBDRM or *Pengurangan Risiko Bencana Berbasis Komunitas*, that aims to improve capacity of community on disaster risk management, were launched in 2013. The pilot adopted PNPM-ND cycle model[6] with some modifications in the methods/instruments due to the introduction of the DRM components. Through the initiatives, GFDRR (Global Facility for Disaster Reduction and Recovery) provided a grant of US$ 2.38 million to support capacity building in DRM for communities, participatory DRM-based development planning, and implementation of DRM-based development model.

Six cities facing high disaster risks were selected as pilot locations[7] namely Padang City, Bandar Lampung City, Gresik Regency, Manado City, Surabaya City, and Sidoarjo City. The selection of the cities considered different typology of hazards, level of risk based on the National Action Plan for Disaster Risk Reduction 2010-2012, poverty rate, and performance of BKMs.

Each *kelurahan* review and revised its Community Development Plan (CDP) with a more comprehensive spatial plan, where risk identification and analysis are incorporated in the planning process. The revised CDP, or better known as Community Settlement Plan (CSP) as in PNPM-ND, is a five-year plan that will be implemented annually based on the priorities for each particular year. The plan includes investment plan (5-year and annual), contingency plan, and emergency SOPs (Standard Operating Procedures). It is further equipped with Community Rules or *Aturan Bersama* (AB) and Operations and Maintenance (OM) Plan, which are formulated through series of meetings and discussions between the community and the local government.

Location of Pilot PNPM Urban - CBDRM and PNPM Urban-ND



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[6] At that time there was a discussion on the possibility of replacing the traditional PNPM Urban model with the ND model

[7] There were two stages for selecting the pilot locations; first in November 2013 (City of Padang, Bandar Lampung, Manado, and Regency of Gresik), and second in June 2015 (City of Surabaya and Sidoarjo)

Figure 11. Mud inside a house in Manado after the flashfloods in 2013;

In the beginning of the planning process, similar to what PNPM Urban does, the community would build and define shared vision or goals for the settlement. As the basis for developing CSP, communities would conduct a Community Self-Survey (CSS) to map the problems and potentials of their locality and to identify their actual needs in order to reach the goals. Simple tool to assess vulnerability, capacity, hazard, and risks are introduced in the CSS through CBDRM, and the results would be mapped and superimposed with other features of the settlement. Priority areas of intervention are defined according to a number of criteria set by the communities, which include, among others, high risk areas and areas where the poorest households and vulnerable groups (women, children, the elderly and people with disability) live. The investments selected have to be robust enough to reduce disaster risks and increase resilience in the area. Despite the designation of particular hazard for each city, the communities may include other types of existing disaster risks in the planning process. For instance, although Padang is a pilot city for earthquake, considering tsunami risks in the planning process is inevitable. Manado, the pilot for landslide, experienced a very destructive flashfloods in January 17, 2013, therefore local communities included floods in the analysis. The following figure illustrates PNPM Urban ND Cycle and how DRM measures are mainstreamed in the process.

The overall program at community level is led by the Community Board of Trustees (BKM), which also coordinates the implementation of PNPM Urban, PNPM-ND, and other development programs. Assisted by PNPM Urban facilitators, the BKM works together with the Kelurahan government in mobilizing local communities and setting-up Community Participatory Planning Team (TIPP). TIPP is responsible for managing the whole planning process and coordinating formulation of the CSP. *Kelompok Swadaya Masyarakat* (KSM)

Main Actors of CBDRM Pilot Project

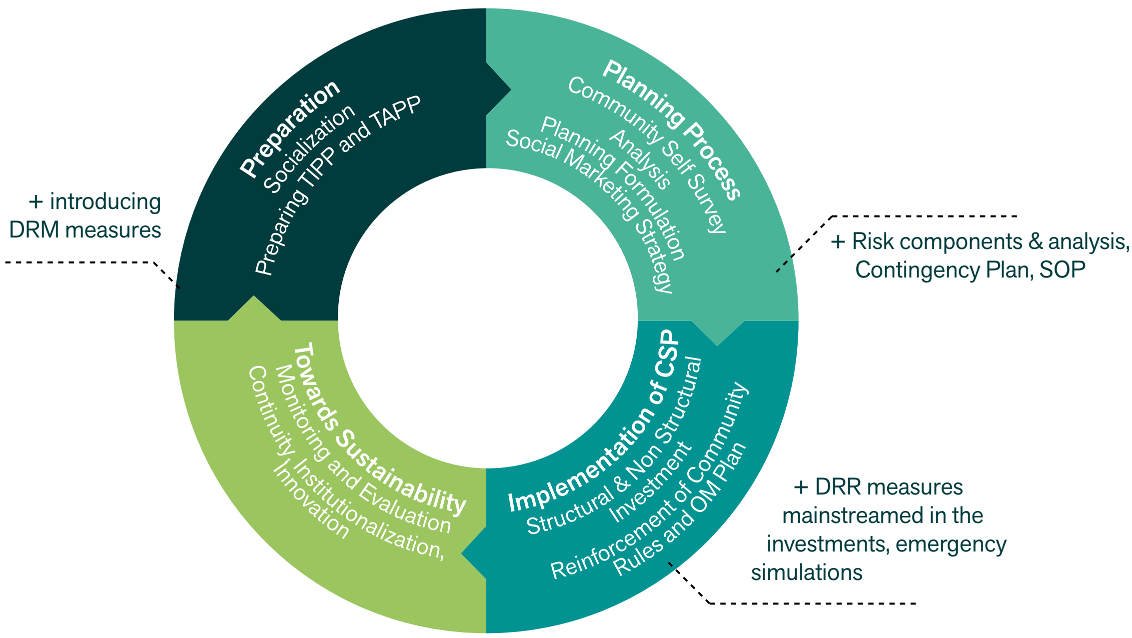
is a group of volunteers who managed the implementation of sub-projects based on the CSP. *Tim Ahli Perencanaan dan Pemasaran* (TAPP) consists of urban planners hired by the communities to help the communities improve the CDP into a CSP-standard, to ensure that the plans were spatially sound and incorporated DRM activities based on a disaster risk analysis. They also advised communities about specific technical design and construction techniques that could reduce disaster risks.

At the city-level government, Technical Team (or Tim Teknis) was formed through City Mayor's Decision Letter. The Team consists of representatives from different local agencies that will assist the local communities in planning, implementation and other supporting activities, and in ensuring the sustainability of the program. The project strongly promotes coordination and collaboration with BNPB, BPBD and other relevant government agencies responsible for disaster management, universities, NGOs working in DRM, and other civil society organizations. Main actors of this project and the coordination/control line are illustrated in the following figure (simplified from real structure).

Technical assistance was provided by the existing PNPM Urban facilitators and consultants from *kelurahan* up to national

Figure 12. The community settlement at the Code River side, Jogjakarta

Mainstreaming DRM Measures into PNPM Urban ND Cycle



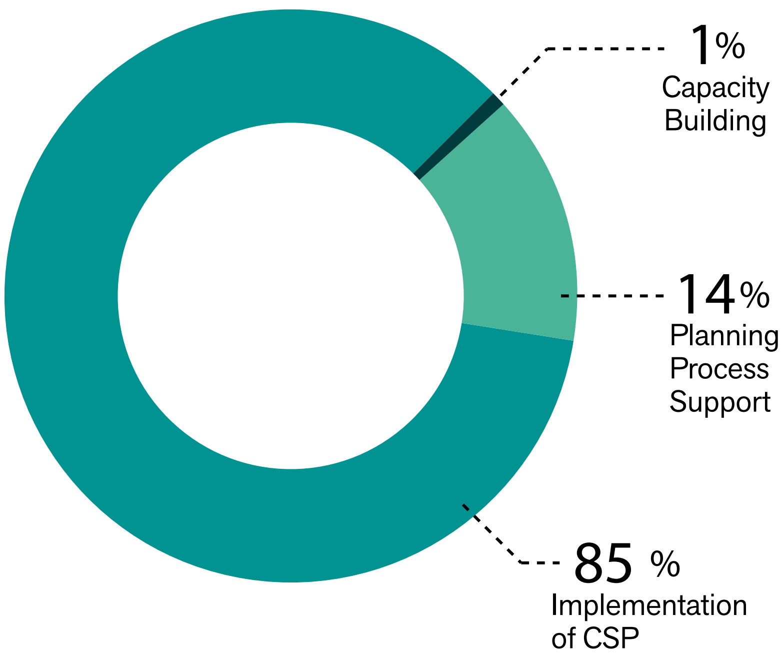
level. An expert of disaster risk management was added at the national level, i.e. the NMC. For service delivery, the PMU at the Ministry of Public Works formulated a set of guideline book as a reference to implement the project at central level up to community level. The guidelines consist of (1) Main Guideline, which outlines basic information about the project, including the objectives, principles, expected outputs, components, stages, and project management; (2) Technical Guidelines, which explains the steps in conducting the project in more details; and (3) a Supplement Guideline for fire disaster[8]. Training was conducted by the PMU and NMC for provincial consultants and city coordinators, who further trained local communities, local governments, and *kelurahan* facilitators.

Monitoring and reporting on the CBDRM implementation was part of the existing PNPM Urban monitoring and reporting system. The implementation was recorded in the same Management Information System (MIS) of the PNPM-Urban. The project also continued the ongoing PNPM Urban/ND complaints handling process, which will allow community members and the general public to channel complaints and inquiries through SMS or email. The guidelines, training modules, MIS and the record of complaints were disclosed in the PNPM Urban's website.

In each CBDRM *kelurahan* of the first four pilot cities[9] (FY2013), community block grants to the amount of IDR500 million (equal to $37,500) were allocated for capacity building and participatory planning (IDR25million, (equal to $1,875)), hiring the TAPP (IDR25million, (equal to $1,875)), operational cost of BKM (IDR10 million, (equal to $750)), and investments as planned in the Community Settlement Plan (IDR440 million or equal to $33,000). Whereas for the two other pilot cities[10] (FY2015), IDR200 million (equal to $15,000) of community block grants were allocated to each *kelurahan* for similar purpose with those of the FY2013 pilot cities.

The National Management Consultant of the PNPM Urban reported that the whole community block grants for CBDRM had been fully utilized 1% for capacity building activities at community level, 14% for planning process support, and 85% for implementation of priority investments based on CSP.

Utilization of Community Block Grants in PNPM-CBDRM Pilot Locations (NMC Report, 2016)



[8] Fire was not included in the early stage of the project design, until the project management was convinced to add pilot location for fire, as one of the hazards with high probability of occurrence in dense settlements in urban areas. It is also one out of seven main indicators of slum as defined by the MPW.
[9] Padang, Bandarlampung, Manado, Gresik
[10] Surabaya and Sidoarjo

Chapter 5

ACHIEVEMENT, LESSONS AND WAY FORWARD

In general, the pilot project has shown positive results. Community participation is relatively higher than that in PNPM-ND. The participation rate of poorest and vulnerable community members in planning and decision making meetings on CBDRM was 53%, and participation rate of women in planning and decision making meetings on CBDRM was 46% (MIS, December 2015).

Local governments responded favorably to the program and different stakeholders provided various forms of support to the local communities. The following chapter will elaborate the project's achievements, lessons learned and the further steps to be taken in mainstreaming resilience measures using the PNPM Urban platform.

Figure 13. Evacuation route plan of Kelurahan Panjang Selatan, Bandar Lampung, made by local communities

Achievements

INCREASED AWARENESS OF DISASTER RISKS

Based on the workshop conducted by the Ministry of Public Works in December 2015, one perceived impact of CBDRM consistently mentioned by all the participants[11] from different pilot areas was that the local communities had experienced an increased awareness of DRM. They learned that disaster casualties and damage can actually be reduced. People also learned that some hazards might exhibit early signs and the most important thing, they knew what to do in time of emergency. Early warning system were introduced through socialization, announcements, and simulations. Another perceived impact was that, through CSP, local communities became aware of safer locations to evacuate and the routes. This learning process has also been transferred to schools in the vicinity of the pilot areas. For example, in Manado, students were taught on how to prepare an emergency bag.

MOBILIZATIONS OF COMMUNITIES AND RESOURCES FOR DISASTER RISK MANAGEMENT

The CBDRM pilot project has mobilized communities and resources beyond what had been provided by the PNPM Urban platform. The program has successfully triggered concern that disaster is everybody's business, as the threats are real for the entire communities, not only the poor. Consequently, the program has been successful in promoting participation of more community members, despite difficulty in finding "fulltime" volunteers to work for the program. To illustrate, the CBDRM's emergency exercise itself that were conducted in 19 (out of 26) pilot *kelurahans*, involved 2,375 participants[12]. The program has triggered the communities to also contribute, both in cash and in-kind. The amount of community contribution in cash for capacity building is about IDR 12 million or USD 900, for planning process is about IDR 40.5 million or USD 3000, and for priority investments is about IDR 890 million or USD 67,000. In total, the community contribution triggered in the CBDRM pilot project is more than IDR 943 million or USD 71,000, or 9.43% of the community block grants.

Figure 14. Emergency simulations in Kelurahan Lolong Belanti, Padang: collaborating with multi-agencies as shown in the banner.

[11] Participants include BPBD, head of Kelurahans, BKM coordinator of the respective pilot area

[12] MIS of CBDRM, May 2016

As in PNPM-ND, the community hired TAPP (Urban Planner) to assist and build capacity of TIPP in incorporating disaster risk management into the planning process. Almost all BKMs reported that it was difficult to find persons with such expertise in their cities. Recruited TAPPs, whose contracts are only 6 months, usually had good skill in data collection and analysis, but they lack capacity to lead formulation of scenarios, contingency plans, and SOPs for emergency. Despite the lack of expertise in DRM, local communities had a strong will to seek support from DRM-related organizations or individuals in their cities that were willing to collaborate voluntarily. Throughout series of socialization, workshops, and capacity buildings, more people from other organizations/agencies were involved. More resources were also mobilized through collaboration with other organizations, in the form of facilities, expertise, and funding. List of stakeholders and the form of collaboration are summarized in the following table.

Table 1. Collaboration Promoted Throughout the Pilot Project

ACTIVITY	STAKEHOLDERS WITH WHOM THE LOCAL COMMUNITIES COLLABORATE	FORM OF COLLABORATION
Capacity Bulding	BPBD, Universities, NGO/NPO/Community Organization, such as MPBI, HFI, Forum PRB, Kogami, Mercy Corps, KSB, Earth Hour), Indonesian Red Cross, Firefighting Department	As a resource organization
	Local government from other city	Study exchange
Planning Process	Various bodies in Local Government, such as: Lurah (head of *kelurahan*), Public Works Agency, BPBD, BPM (Community Empowerment Agency), Bappeda (In Surabaya and Sidoarjo's case, Fire Fighting Office). In several locations, Bapedalda/BLH (Environmental Agency), BMKG (Agency for Meteorology, Climate and Geophysics), Education Agency, Tagana	Providing technical inputs
Implementation	BPBD, Indonesian Red Cross, NGO/NPO/Community Organization, Police Force, Community Health Center (Puskesmas), Firefighting Department, Tagana, the Search and Rescue team (SAR)	Monitor that the DRM measures are taken into account
	Local private companies	Providing funding
	School committee	Organizing DRR campaign

DRM-MAINSTREAMED INVESTMENTS

CBDRM pilots have implemented priority investments based on their CSPs, which include both structural and non-structural investments. Priority investments had been used mostly for tertiary roads and bridges, drainage, and retaining walls, as shown in figure below. Disaster risk management measures were already incorporated in the investments. The type of investments are summarized as follows:

- Infrastructure that are functioned for DRR and emergency response, such as roads that may also be used for emergency evacuation, dykes, shelter, and reinforced buildings designated for temporary evacuation.
- Infrastructure with better building materials, structure and technology. The quality of engineering design, structure and material are generally better than those of the regular PNPM Urban, mostly because the infrastructure built has to meet specific conditions to be disaster-proof. For example, drainage system improvement and water supply in dense settlement. Local public works agency helped the BKM and facilitator to modify the technical design, select the material and supervise the construction. Positive impacts of the CBDRM pilot investments were felt in Gresik, where two neighborhoods which usually were exposed to floods are now safe, since the drainages are now well-connected with the city-wide drainage system which has also been normalized.
- Means of risk communication, such as public information board, signage, CBDRM awareness movie, socialization of early warning system procedures, disaster education activities at schools, and emergency exercise. As per December 2015, based on the MIS, there were 17,804 units of shelters and warning signs provided through CBDRM.

Investments in PRBBK (MIS, December 2015)

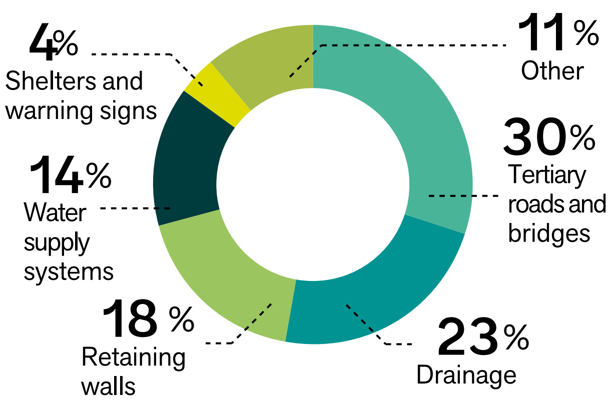


Figure 15. Fire disaster management exercise in Sidoarjo.

Lessons Learned from Mainstreaming Resilience Measures into CDD Project

LOCAL GOVERNMENT'S PRESENCE IS ESSENTIAL

In several locations, it was indicated that most data used for analysis were mostly those collected/ owned by local communities, and less data from the local government (e.g. on local regulations related to DRM, early warning systems). Consultations with local government, particularly BPBD, were done towards the end of the planning process. This has sometimes led to not-so-robust risk analysis and lack of synchronization with larger/higher-level systems. In other locations, local government and local authority (village officers, community leaders) have paid more attention and were technically involved since early planning process until the emergency exercise. Data and technical inputs were provided for TIPP, while the consultation process took place beyond the formal meetings. In those locations, it took longer to complete the CSP, but results were more satisfactory.

Therefore, local government played an important role since the beginning of the planning process, inter alia, by providing city level data and plan, technical guidance, confirming delineation of disaster prone areas, technical design for disaster-proof infrastructure, and building capacity of the local communities to synchronize their programs with the local government programs.

Challenges have also been found in the collaboration with local governments. The high turnover rate of government officers that were tasked to handle the project has often slowed down the pace of the project, as consultation process need to be repeated to different persons and efforts need to be further synchronized.

Figure 16. Fire-fighting vehicle which fits narrow roads in dense settlements.

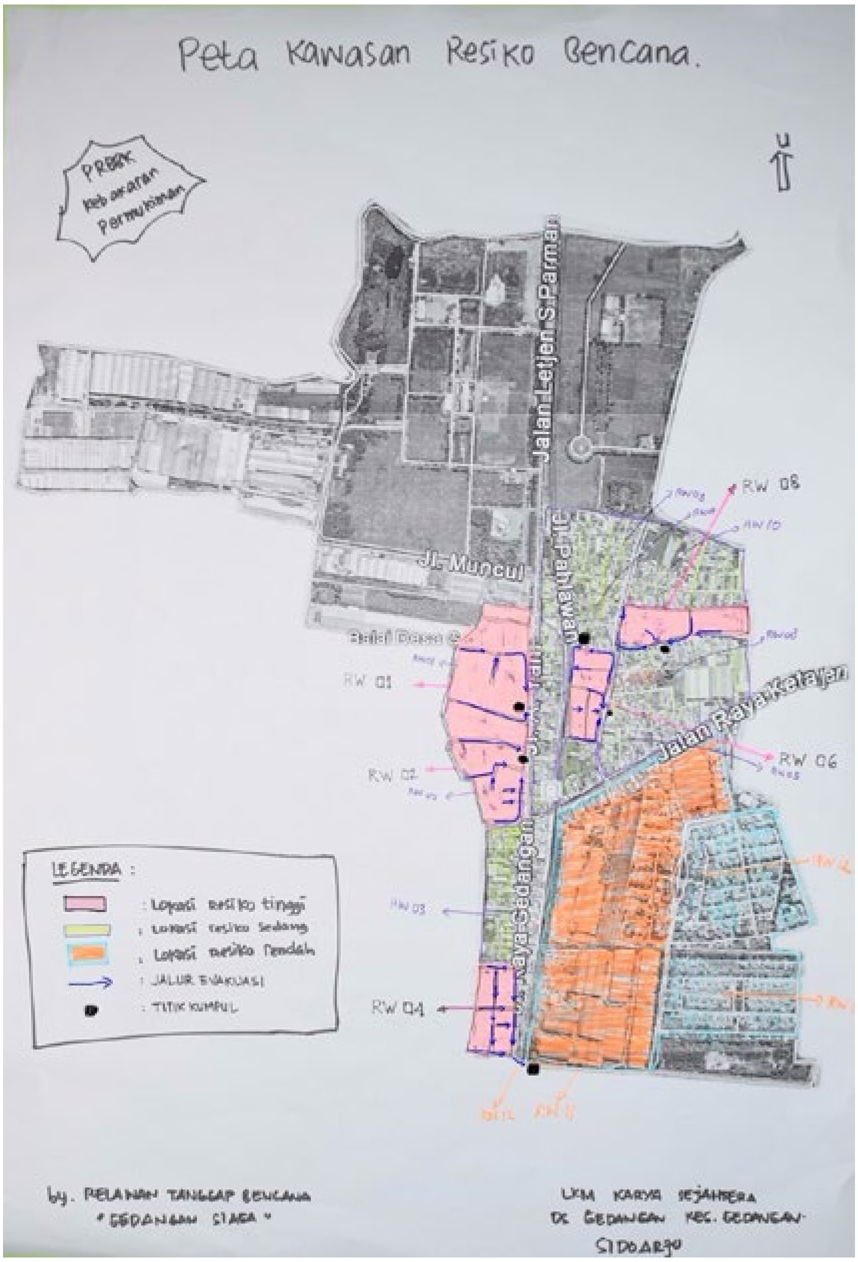


Figure 17. Community-made Maps in Sidoarjo, Providing Information on Risk.

RISK MAPPING HAS BEEN A HELPFUL DECISION MAKING TOOL

The risk mapping that was conducted prior to the selection of the priority areas of intervention has proven to be useful in minimizing the practice of bagi rata (distribute equally regardless of the needs). This practice, which some local communities considered fair, were found in some PNPM-ND locations. Since the vulnerability and capacity map themselves were made from scratch by the communities, confirmed by the local government and other experts during the risk analysis, they realized the real risk faced by each area of the *kelurahan*. In this way, community learned ways to prioritize based on data, maps, and visual evidence.

COMMUNITY-BASED APPROACH EMPOWERED LOCAL COMMUNITIES

Small champions in disaster risk management in each pilot city were born from this project. At least from TIPP members alone, there were 955 persons (35.2% are women), who were already trained to lead community self-survey, risk analysis, planning, and to build relationship with local governments as well as other stakeholders. The number of small champions might reach beyond the number of TIPP members, as there were more people involved as volunteers.

Table 2. Estimated Number of Persons Empowered through the Pilot Project

ACTIVITIES	TOTAL PARTICIPANTS	% WOMEN PARTICIPANTS
TIPP members	955	35.2
Community Self-Survey	3390 (279 events)	49.8
Disaster Risk Analysis	1626 (66 events)	54.2

Source: MIS of CBDRM, May 2016

THE PROJECT EXTENDS LOCAL GOVERNMENT'S OUTREACH IN DISASTER RISK MANAGEMENT

The community-based approach was able to extend the outreach of existing local government's programs related to disaster risk management. It is often that the participation to the local government program's socialization, planning, and decision making, reached only down to certain administrative government level (e.g. *kecamatan* or *kelurahan*), while in CBDRM, those activities had been progressing at the grassroot level with local government's assistance.

In locations with high disaster risks where government services are not present, such as dense settlements in Surabaya and Sidoarjo, that are usually unreachable to the fire brigades, tried to solve their own problems, with the technical advice of the fire brigades. In Surabaya, the local communities made an agreement with the fire brigades not to add road humps inside dense settlements, as it may slow down the speed of the fire brigades. In the areas with very narrow roads, where the firetrucks would not fit in, the

Figure 18. Disaster education through a film at a school in Sidoarjo.

fire brigades assisted local communities in setting up water source facilities to supply water in case of fire. In the pilot area in Manado, local communities made an agreement to the local government, that they would lend their vehicles in case of evacuation (as stated in their contingency plan). Mosques and churches, besides the Lurah (head of Kelurahan) himself, were in charge of disseminating the local communities' rule that prohibits people to build new houses on disaster prone areas, which supports the local government's regulation (*Perda*). Local government of Lampung stated that participatory risk mapping done through CBDRM was indeed effective and replicable, since to date they have just relied on maps given by BMKG (Indonesian Agency for Meteorology, Climatology, and Geophysics)

COMMUNITY-BASED APPROACH ENCOURAGED FURTHER EFFORTS AT CITY LEVEL.

Prior to the introduction of CBDRM, several disaster-related initiatives have indeed already existed in the pilot cities, but they tend to be stand-alone programs by particular government sector, rather top-down, and have not been mainstreamed into regular development. The existing local government programs were mainly related to emergency response and preparedness, such as capacity building, socialization, simulation, provision of emergency facilities (e.g. firefighting trucks, siren, and communication tools for *kelurahan*/ kecamatan), provision of emergency response training for volunteers, and formulation of SOPs for particular hazards.

Figure 19. Community Self-Survey (CSS) activity in Manado

Most of the pilot cities (and cities in Indonesia) have no complete set of Disaster Management Plan, Contingency Plan and SOPs yet. Padang and Surabaya are among cities that already have Disaster Management Plan for earthquake and fire respectively. Bandar Lampung, the pilot city for tsunami, had not issued any contingency plans related to tsunami, despite the high risk. Due to low occurrence (latest tsunami was in 1883), the local government perceived higher risk for floods and earthquake which occurred several times lately. Therefore, local communities in the pilot areas did not have the city-level plan regarding tsunami for them to refer to during the formulation of tsunami contingency plan and SOP. The community movements during the planning process have encouraged the local government to formulate city-level disaster management plan in the near future.

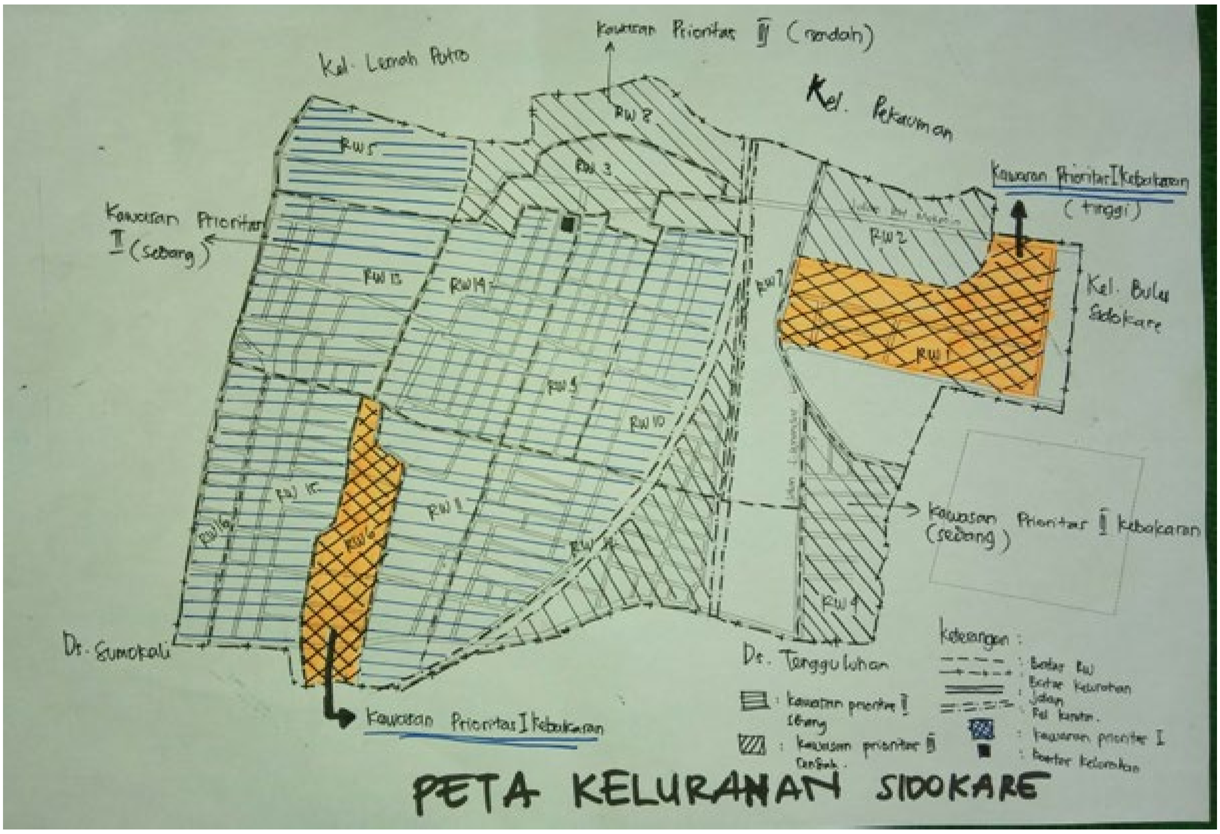
In Manado, the absence of disaster management plan and contingency plan at the city level has led to uncoordinated policies for flood and landslide mitigation by a number of local government agencies. Efforts by different local government agencies were mapped only when the TIPP conducted data collection and analysis through CBDRM. In the end, CBDRM adds value to the synchronization of local government programs for floods and landslide

Figure 20. An example of a earthquake-resistance house in Jogjakarta, built after the Mount Merapi eruption (2010) with the community-based approach.

LAND ISSUES AND CITY PLANNING SHALL NOT BE OVERLOOKED WHEN MAINSTREAMING RESILIENCE MEASURES INTO DEVELOPMENT

Illegal land and building without permits in some cases became one of the reasons why an area was not chosen as priority area of intervention. On the other hand, such areas are often located on disaster prone area. For instance, in Manado, the pilot city for landslide, low income settlements are built on steep slopes, but since the local government referred to the city regulation or *Perda*, despite the high landslide risk, they recommended the local communities to eliminate several proposed priority areas that are illegal, and to replace with those having legal land status yet lower landslide risks. In a long term, shifting only the priority into the less prone area to disaster will not solve the main problem. Local government needs to revisit the city plans, regulations and finally deal with illegal settlements somehow, in order to achieve resilience. As for the CBDRM practice by local communities, identification of land ownership and legal status, as well as the city plans, need to be considered throughout the planning process.

Figure 21. The Priority Area Map of Sidokare, District of Sidoarjo, prepared by the community.



Way Forward

At the time this report is being written, a new national platform on slum upgrading and slum prevention that puts the local governments in the central role, and holds 'collaboration' as the main principle, has just been launched. The platform, i.e. *Kota Tanpa Kumuh*[13] or KOTAKU, will build upon the existing PNPM Urban platform. KOTAKU will mainly work at two levels, i.e. city and community levels, while ensuring good coordination with national and provincial government and collaboration with all relevant stakeholders. It will adopt the lessons learned from PNPM-ND and PNPM Urban's pilot projects, including CBDRM, with additional focus on city-wide planning for slum upgrading and prevention. The objectives of KOTAKU is to improve access to urban infrastructure and services in targeted urban slums, in order to achieve zero slum within the next five years. This could be considered as national scale up from initially only 6 cities in 4 provinces to 271 cities in 34 provinces.

The following table show the least measures to be introduced throughout the KOTAKU project cycle to ensure that the DRM is mainstreamed, as stated in the KOTAKU's Environmental and Social Management Framework (ESMF).

Table 3. Measures to Mainstream DRM in KOTAKU

NO	PROJECT CYCLE/ COMPONENTS	DRM MEASURES TO BE INTRODUCED
1	Training	Provide the project participants knowledge, skills and tools to take DRM measures as necessary in each project cycle
2	Preparation of SIAP and CSP	Include assessment of disaster risks (hazard, vulnerability and capacity) in the analysis and consider disaster risks in the subproject design and budgeting. Formulation of Contingency Plan and SOP for hazard in the respective areas and regular simulation, need to be taken should high disaster risk with high probability of occurrence are identified.
3	Preparation of DED	Ensure that the design and materials used are appropriate for disaster-resistant infrastructure
4	Implementation	Monitor that the DRM measures are taken into account
5	Operation and Maintenance	Retrofitting existing infrastructure, maintain the quality and effectiveness of the infrastructure/activity
6	Institutional Arrangement	Effective collaboration with all stakeholders

Source: Environmental and Social Management Framework of KOTAKU, 2016

[13] Kota tanpa kumuh means "city without slum"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Contents

Chapter 01

Economic Impact of Disasters in Indonesia

1.1 Overview

Indonesia is one of the most disaster-prone countries in the world. The Indonesian archipelago, recognized to be one of the largest in the world, has more than 13,000 islands out of which 6,000 are inhabited. Situated on the Pacific Ring of Fire and at the meeting of the active Indo-Australian plate in the South, the Eurasian plate in the North and the Pacific plate in the East, the country is highly exposed to numerous different hazards and vulnerabilities and have differing levels of disaster response capacity and ability to manage the consequences of crises.

Indonesia is situated in one of the world's most active disaster hot spots where several types of disasters such as earthquake, tsunami, volcanic eruption, flood, landslide, drought and forest fires frequently occurred. According to the World Bank global risk analysis, Indonesia is among the top 35 countries that have high mortality risks from multiple hazards with about 40 percent population living in areas at risk. For a country that has more than 230 million population this percentage gives a very large nominal number of more than 90 million population potentially at risk of creating a major humanitarian catastrophe should large disasters occur. According to data from the National Agency for Disaster Management (BNPB), over the last 30 years there has been on average 289 significant natural disasters per year with the average death toll from such events reaching approximately 8,000.

The relatively high death toll associated with natural disasters in Indonesia was partly driven by rapid uncontrolled urbanization and construction practices that disregard proper hazard zoning and building codes. Many public infrastructure facilities were built before new information on risk zoning was available. With the Government recently issued a new earthquake zoning map and revised the building code, many buildings including

Fact Sheet – Indonesia

- 13,466 islands (largest archipelago in the world)
- 34 provinces, 416 districts, 98 municipalities and 7,024 sub-districts, and 81,626 villages/urban villages
- 81,000 km coastline (2nd longest in the world)
- Population of 237 million people (4th most populated in the world)
- Mega Biodiversity (10% plants, 12% of mammals, 16% of reptiles, 15% fish,17% of bird in the world live in Indonesia) – 3rd largest in the world
- 13% or 129 active volcanoes in the world (1st in the world)

most public schools, for example, are considered sub-standard to the proper earthquake resistant requirements.

Historical data from damage and losses assessments (DaLA) from Indonesia's recent natural disasters, from the Aceh Tsunami in 2004 to the recent earthquake in Central Aceh on July 2013, consistently demonstrate that the greatest negative impact of such disasters is on i) housing/ settlement; ii) essential infrastructure such as roads; and iii) social infrastructure, particularly schools and hospitals.

The economic impact of disasters event for the fiscal capacity of the affected region have been significant. In many cases of the disaster events, the regional government requested the assistance from the central government for emergency response and post disaster reconstruction and recovery.

1.2 The Impact of Disaster to Education Sector

In many earthquakes, the impact on school infrastructure was very significant. The 2004 earthquake and tsunami in Aceh damaged more than 2,000 schools, while the West Java earthquake of 2009 also

Tabel 1. Disaster Damage and Loss in 2004-2014

Year	Damage/Loss	Disaster Event
2004	41.400	Gempa Bumi dan tsunami Aceh dan Nias
2006	26.100	Gempa bumi Yogyakarta
2007	9.600	Gempa bumi Sumatera Barat, Banjir Jakarta, Gempa bumi Bengkulu
2009	20.900	Gempa Bumi di Padang
2010	7.930	Gempa Bumi dan tsunami di Mentawai, banjir bandang di wasior, erupsi gunung Merapi
2013	7.500	Banjir DKI Jakarta
2014	17.530	Erupsi Gunung Sinabung, Banjir DKI Jakarta, Banjir di Jawa Tengah, Banjir Bandang Sulawesi, Banjir di Pantai Utara Pulau Jawa dan erupsi gunung Kelud.

damaged more than 2,000 schools, and the one in West Sumatra also in 2009 damaged 2,800 schools. Indonesia can be considered as lucky, as these earthquakes had so far occurred outside of school hours. But the risk is very alarming as the above events alone could have killed more than 2 million children.

The high vulnerability and exposure of school infrastructure to disaster is influenced by a combination of poor construction practices and the lack of awareness on disaster risks among the school communities, particularly those living in disaster prone areas. Most public elementary schools in Indonesia, for example, were built in the 70s when building code was insufficient and enforcement was practically absent. With the Government at that time only had limited resources relative to its ambitious goal for constructing new schools under a program known as SD Inpres (Elementary

Schools built under a special Presidential Instruction).

The impact of disaster is also on the continuation of the learning and teaching process. A disaster event caused a halt to the education process. The disruption to the education process can last up to 3 month. The temporary school made of salvaged materials will also influence the

quality of teaching delivery and learning process. The reconstruction of the school facilities impacted by disaster also takes time due to the system of government budget planning. The capacity of the local government is very limited to respond to the impact of disaster on the education sector.

In the Merapi eruption event, the disaster caused the negative impact to the education sector including the continuity, due to the following issues: i) students and teachers were also impacted by disaster, ii) students became refugees together with their parents, iii) school infrastructures were severly impacted by the eruption, and iv) many unaffceted school buildings were used as temporary refuge shelters.

Similar to the one in Merapi eruption event, in many disaster events, the schools unaffected by disaster directly was usually utilized as the refuge area. The refugee would stay in the school building in months till the government could provide the temporary shelters. The temporary refugee facility also influenced the teaching and learning process. There is no hard evidence to the direct impact of the student's achievement, but the impact is eminent.

Chapter 02

Problem, Challenge and Opportunity in Managing Big Number

Provision of the safe education system in Indonesia being a prone country to disasters, has always been challenging. The spread of geographic location, typology of school buidling structures and available funding capacity of the government are among the prolematic existing condition being faced by the Indonesia education sector.

Despite the abovementioned issues, the existing condition of education including the government programs poses some challenges and opportunities toward achieving the safe school initiative mainstreaming and implementation.

1. Problem

Education sector in Numbers. According to the 2016 Statistic and Data Center of Ministry of Education and Culture, there are 212, 814 school ranging from elementary education, primary education, high school, vocational school, school for special need in Indonesia. The schools are managed by 2, 922, 498 teachers and school principals. The total students from all level of education is 44,510, 563. This number, of course, poses problems and challenges but at the sama time opportunity to improve the eduction quality.

School construction financing mechanism. Constructions of public schools in Indonesia have been financed through different mechanisms. In the 1970s-1980s most elementary school constructions and repairs were financed through grants from the National to local governments under the Presidential Instruction (SD INPRES). The issues with this INPRES was that the school location selected was prone to disaster. Within each fiscal year of this program, between 10,000-20,000 new schools were constructed and roughly equal numbers of existing school were repaired.

Under the current decentralized system, constructions of new elementary and secondary schools were financed through block grants to local governments with implementation managed by school construction committees. In recent years, school improvements and rehabilitations were financed through transfer to local governments under the Special Allocation Fund (DAK).

Financing the school resilience. The provision of funding for constructions and/or repairs of school facilities have not specifically been targeted to building resilience structures and facilities to disasters, although construction and repair of schools in disaster impacted areas were given priorities.

Issues in building code compliance. The Government of Indonesia had taken the need for major school rehabilitation very seriously. Between 2010 and 2012, more than US$ 3 billion had been allocated to rehabilitate heavily damaged classrooms around the country, mostly through fiscal transfer mechanism to district governments (DAK). According to education official statistics, between 2007 and 2009, more than 10,000 new schools were also constructed. However, given the sheer number of schools to be rehabilitated and built, ensuring compliance to the proper construction standards especially for earthquake resistance, is a major challenge.

Low safe school construction capacity.
In the past, most school rehabilitation projects including those funded by the DAK in its earlier year were carried by local contractors which were deemed prone to mark up and low quality construction. In 2012, the Ministry of Education and Culture promoted school managed construction where school management and committees, parents and local community are more involved in ensuring quality of rehabilitation projects. The monitoring and supervision process by school management and school community was emphasized to ensure the compliance to building code with the assistance from the trained and capacitated safe school facilitators.

Picture 2.1 School with limited open space

Picture 2.2. School with limited access to clean water

2. Challenge

Large number of school in disaster prone areas. There are more than 258,000 schools in Indonesia, it is estimated that 75% schools are located in disaster prone areas. Most primary schools were built in the 1980s, where DRR aspect was not considered. To this end, a programmatic approach must be formulated to response to this challenge. The fiscal capacity of the government is limited. In that case, priority determination must be be also made. The school risk-based approach can be optioned addressing this very imperative challenge.

Missing coordination among relevant sectors. Issues of lack in coordination between central, provincial and local government. Policies are in place at the national level. As the education involves various government, many stakeholders has different role. This needs also leadership in leading the task. BNPB should take role in this position to ensure the operationalization of the safe school initiative.

Scaling-up and evaluation and monitoring issues. Up to 2014, more than 25.620 pilot schools have been completed, but scaling up are still a major challenge. The challenge is due to the limited fiscal capacity, baseline, map and programmable approach toward complete problem solution. Evaluation to those pilot schools should be conducted to be considered for certification requirements. The methodology, applicable mechanism and tools must be created linking to the database system in Ministry of Education and Culture. To date, assessment and evaluation of school condition is conducted by school principals without capacity in engineering.

Importance of Partnership. Strengthening of partnership with related stakeholders for mainstreaming Safe School in Disaster Risk Reduction during the transition of the new government become imperative. This partnership can fill the government gap in fiscal and technical capacity. Pushing the agenda of safe school initiative sustainability will also require this partnership. The non-government parties can be sourced for skills, tools and technical assistance the government has limited capacity to provide.

Competing Issues. Lately, there have been various issues emerged in Indonesia, namely gender, environment, narcotics, sex education, health and disaster risk reduction. Schools have been targetted for the implementation of this issues. To schools and principals, this quite confusing. In line with the above, to ensure the success of acceptance and internalization of the safe school initiative agenda-standards and principles in school level, the process must factor the mentioned competing issues. Integration and inclusion of other issues into the safe school initiative could also be considered.

3. Opportunity

Integration of safe school initiative to education agenda in Indonesia. The opportunity that can be utilized in the implementation of the safe school program and agendas in Indonesia. The effort to integrate safe school initiative and program in Ministry of Education and

Culture Strategic Plan must be pushed. The integration to regular development plan will ensure the implementation of the safe school program with government modalities. This will also ensure the continuity and sustainability of the initiative in country wide.

Utilizing the establishment of safe school secretariat. In line with the above, revitalizing and strengthening the National Safe School Secretariat to better coordinate stakeholders and Safe School Implementation is also important. Safe School secretariat will manage the issues and problems to be pushed. The safe School related data can be coordinated by the secretariat through coordination with DAPODIK center. The intervention that needs to be undertaken is the development of the risk map in effort to support the risk-informed decision and policy making related to education program in Indonesia.

Evaluation and monitoring mechanism. Development of the monitoring and evaluation system and mechanism aimed at better planning and better safe school program implementation and new school construction and retrofitting of exiting old schools. The standardized evaluation and monitoring tools factoring the building codes stipulated by the government, Indonesia school typology, and school risk identified, would be important and urgent in addressing problems in school structures and school construction practices.

Formulation of the regulation, guidelines imperative. The dissemination of the current regulation, guidelines and build capacity to local governments at sub-national level must be conducted. Integration of the safe school knowledge into curricula is also important. This knowledge must be internalized toward complete comprehension of the school management on the safe school initiatives and program as well as the principles. Toward this end, the continuous training to local government and school principals must be conducted. In particular to the schools that are not involved in pilot program.

Implementation of safe school standards and principles. According to the 2014 data, there are 747,358 classroom for primary school (SD) and 231,643 classrooms for junior high school (SMP) are damaged. This poses problems but at the same time opportunity to implement the safe school standards and principles. The capacity of the government to construct new school is around 300 schools per years. The demand for new school for SMP is 4700 school reflecting 34,900 classrooms to be built for the next 5 years. In fulfilling the need of new schools construction, safe school approach in particular retrofitting old schools can be implemented to fill the gap.

Safe School Momentum and Initiatives

3.1. One Million Safe Schools and Hospitals Campaign

One Million Safe Schools and Hospitals Campaign was conducted in May 2010 by United Nations International Strategy for Disaster Reduction (UNISDR). An important action following to the campaign was a National Campaign on Safe Schools and Hospitals that was launched by the Coordinating Minister for People's Welfare accompanied by the Head of National Disaster Management Agency (BNPB), Minister of Health and the Vice Minister of National Education in July 2010. This activities involved among others Ministry of Home Affairs, Ministry of Religion, Ministry of Public Works and stakeholders from NGOs, Academicians, International Development Partners, independent e This national campaign was supported by stakeholder working disaster risk reeducation in education sector.

The Vice Minister for National Education of Indonesia pledged 3,000 schools to ensure compliance with school safety standards, and the Education Office at provincial and district/ municipality level were urged to participate in the campaign and its school safety standards implementation. The Minister of Health pledged 100 safe hospitals and promised to instruct local departments of health at provincial and district level to establish safe hospital and other health facilities with funding allocation. Both private and public hospitals would be encouraged to ensure disaster preparedness. The Vice Minister for National Education pledged to ensure that more than 3000 of schools would comply with school safety standards, adding he would urge the education departments at district and province level to participate in the campaign.

The National Agency for Disaster Management also pledge so socialize and promote safe school and hospital awareness in schools and hospitals, starting with a meeting involving five districts in Sumatera. The Coordinating Minister for People's Welfare, would encourage the heads of local government to allocate funding for programmes and activities that will support the establishment of safe schools and hospitals.

3.2. National Program for School Building Rehabilitation

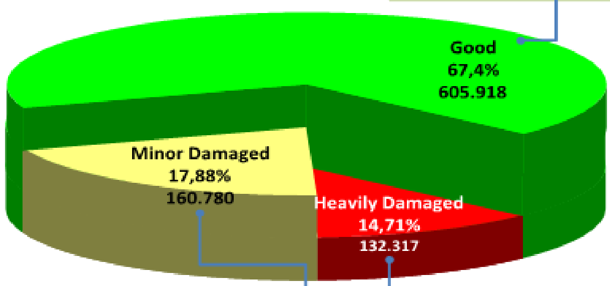
The Safe School campaign has monumental impacts; the Ministry of National Education has worked very hard identifying damaged schools/classrooms nationally, starting with West Java, in 2010-2011. Below is the charts presenting number of damages classrooms. The heavily damaged classrooms showed significant numbers that needs great amount of budget for rehabilitation.

The identification of damaged classrooms in 2010-2011 was a great momentum to obtain the overall picture on school building condition in the country. The results of the identification showed significant numbers 132,317 (14,7%) of heavily damaged classrooms of primary

The Number of Classrooms at Elementary School (SD) by Condition in 2011

	# classrooms	# schools	% classrooms
Public SD	808.872	130.563	92,42%
Private SD	90.144	12.689	7,58%
Nasional	899.016	143.252	100%

Public SD	528.239	(58,76 %)	87,18%
Private SD	77.679	(8,64 %)	12,82%
Total	605.918	(67,40 %)	100%



Public SD	148.593	(16,52 %)	92,42%
Private SD	12.187	(1,35 %)	7,58%
Total	160.780	(17,88 %)	100%

Public SD	124.126	(13,08 %)	93,81%
Private SD	8.191	(0,91 %)	6,19%
Total	132.317	(14,71 %)	100%

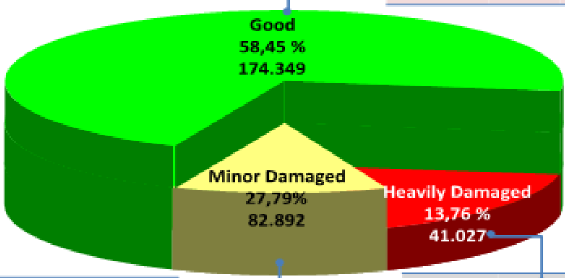
Sumber Rakor Rehabilitasi SD SMP tahun 2012

3

The Number of Classrooms at Junior High School (SMP) in 2011

	# classrooms	# schools	% classrooms
Public SMP	212.740	19.425	71,33 %
Private SMP	85.528	11.758	28,67 %
Nasional	298.268	31.183	100 %

Public SMP	118.274	(39,65 %)	67,84 %
Private SMP	56.075	(18,80 %)	32,16%
Total	174.349	(58,45 %)	100 %



Public SMP	63.927	(21,43%)	77,12 %
Private SMP	18.965	(6,36 %)	22,88 %
Total	82.892	(27,79 %)	100 %

Public SMP	30.539	(10,24 %)	74,44 %
Private SMP	10.488	(3,52 %)	25,56 %
Total	41.027	(13,76 %)	100 %

Resource: Coordination Meeting for SD SMP Rehabilitation in 2012

4

Budget Allocation for Massive School Rehabilition Program 2011-2012

(Million Rupiah)

School Level	Total Budget Needed		Rehabilition Program in 2011		Rehabilition Program in 2012*	
	# of Classroom	Budget	# of Classroom	Budget	# of Classroom	Budget
Elementary	150.317	13.316.083	18.000	1.275.190	132.317	12.040.893
Middle School	44.527	4.103.545	3.500	322.195	41.027	3.781.350
TOTAL	194.844	17.419.628	21.500	1.597.385	173.344	15.822.243

Central Budget 2011 Rp. 0,7 T

Special Allocation 2011 Rp. 0,8 T

Central Budget -2012 Rp. 7,8 T

Special Allocation 2012 Rp. 8T

Total budget allocation for rehabilition in 2012 was US$ 1,6 Billion

with the currency of 1US$ = Rp. 9,367,- in 2012

12

Source: Presentation of MoEC in Bangkok, June 2014 school (SD) and 41,027 (13.76%) of heavily damaged classrooms for junior high school (SMP). This has triggered the Government to develop a National Program for School Rehabilitation and construction of New School Unit Program. The new school unit program to address the totally damaged schools and increase access to school, especially with obligation for 12 year schooling.

According to the 2014 data, there are 747,358 classrooms for primary school (SD) and 231,643 classrooms for junior high school (SMP) are damaged. The capacity of the government to construct new school is only around 300 schools per years. The demand for new school for SMP is 4700 school reflecting 34,900 classrooms to be built for the next 5 years.

In 2015, the Directorate of Primary Education targeted to rehab 9,811 classrooms (medium and heavily damaged classrooms) with budget of 2015 IDR 751.2 Million, though at the end of 2015 there were still significant numbers of damaged classrooms according to National Education Data (Dapodik), 59,490 schools or 246.316 classrooms (72,549 totally damaged classrooms; 77, 232 heavily and 96,535 medium damaged classrooms. The above situation on damaged schools have been a good momentum to implement safe school standards

A National Workshop on Safe School conducted in December 2010 in cooperation with Ministry of National Education, National Agency for Disaster Management (BNPB-Badan Nasional Penanggulangan Bencana) and Plan Indonesia supported by other DRR stakeholders. This workshop resulted to among others the need to identify schools located in disaster risk areas and a circular letter to inform the regions head for mainstreaming disasters in education sector into their curriculum to establish safe school.

Based on request of the Ministry of National Education to BNPB and the World Bank, the mapping was conducted and resulted to 75% schools are located in disaster prone areas. This has made more confident of the government to invest in a massive National Program for School Rehabilitation in stages from 2011-2014. The budget for 2011-2012 is focused mostly to rehabilitate the heavily damaged classrooms with total amount IDR 17.4 Trillion equivalent to USD 1.6 Billion.

3.3. DAK Program for School Rehabilitation

One of School rehabilitation program is financed through Specific Allocation Fund (DAK-Dana Alokasi Khusus). In 2011, the central government allocates 80% for primary education (SD) and 20% for Junior High School (SMP) for DAK implementation in 2012. 80% allocated for primary education and Junior High School are directed for rehabilitation of heavily damaged schools. This is for supporting the national school rehabilitation program, focusing on heavily damaged schools. The proportion of DAK 2013, 16% for Senior High School (SMA) and SMK (Vocational School) 24%, 40% out of each earmarked for rehabilitation of heavily damaged schools ; while the proportion for primary education is 35% and for Junior High School is 25%, out of each, 35%-65% can be used for rehabilitation of medium damaged schools.

The Safe School stakeholders (BNPB, Ministry of Public Works, BPPT-State Ministry of Research and Technology, Bappenas, Planas (National Platform), Kerlips, Plan Indonesia, UNESCO Jakarta Office, PPMB ITB and the World Bank) supported the development of technical guideline for DAK 2012, which include safe school principles, structural and non-structural issues. For the first time the Technical Guideline for DAK 2012 contained instruction for construction of earthquake resistance building.

School Rehabilitation Self-Management (Swakelola). The DAK 20212 for the school rehabilitation is implemented by self management (swakelola). Usually a team consist of school community under the leadership of School Principals established as committee for School Rehabilitation or construction. On the other side, a parallel program financed by Bansos program, APBN from Ministry of Education and Culture take contractual mechanism using the third party services from planning, detail design and the construction. The self-managed school rehabilitation program has more freedom to design and implement the construction, though it has to follow the technical guideline provided. The District Education Office provided the Management and Technical consultants for both program usually has no knowledge on the Safe School yet.

3.4. Safe School National Secretariat Establishment

The National Secretariat for Safe School was established in August 2011, under supervision of Vice Minister for Education, Ministry of Education and Culture and the World Bank funded a personnel and its operation. Many discussions for formulation of Guideline for Safe School/Madrasah led by the Secretariat and consulted to the Vice Minister for Education, at the end, the Vice Minister of Education decided that the guideline would be more appropriate to be issued by BNPB. BNPB supported by the Secretariat and the GFDRR/World Bank team finalized the draft guideline. In May 2012, the Guidelines for Safe School/Madrasah was issued by Head of BNPB Decree No. 4/2012 and launched by the Minister of Education on the National Education Commemoration Day in May 2012.

Since the Perka BNPB No. 4/2012 on Safe School/Madrasah issued, the Vice Minister requested the World Bank to support the Pilot implementation. 180 Schools in West Sumatra, West Java and West Nusa Tenggara have been piloted for Safe School implementation. The Result will be in this Chapter below. Since then, many other actors work in Safe School tried to implement the guidelines and some other work to increase Safe School awareness among others Plan Indonesia, Save the Children, Kerlips, ASSI and many others.

3.5. Asian Ministerial Conference on Disaster Risk Reduction

The three events related to Safe School during the 5th AMCDRR, 22th – 25th October 2012 has gained momentum as the basis for the current program Global Program for Safe School in several countries including Indonesia. The Government of Indonesia hosted the 5th Asian Ministerial Conference for Disaster Risk Reduction (AMCDRR) in Yogyakarta. The three events on Safe Schools were conducted at the 5th AMCDRR are:

a. Pre-conference session on Sharing Experiences of Safe Schools and Hospitals
b. Special Session on Global Program for Safe Schools and Hospitals
c. Side event session on Children's Participation on Safe School

A Yogyakarta Declaration – endorsed by Heads of Government, Ministers, and Heads of Delegation of countries in Asia and the Pacific, as an outcome of the 5th Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR), calling on disaster risk reduction (DRR) stakeholders among others to build local community resilience which contains of promote, replicate and scale up successful community-based DRR and CCA initiatives at the national and local levels; develop common disaggregated targets and indicators for resilient communities that can be used by governments, civil society organizations and practitioners in developing disaster-resilient villages and communities; enhance the adaptive capacity of communities and local institutions to respond to emerging and future risks; support local level efforts for safe schools and hospitals in cost-effective manners and initiate the global programs; and refocus development priorities towards building overall local resilience that includes natural, social and economic aspects as well as infrastructure capacities through community-based mechanisms.

The 6th AMCDRR was conducted in Bangkok on 22-26 June 2014. The 2014 Bangkok Declaration appreciated all countries which have been hosted the implementation of AMCDRR, including the Government of Republic Indonesia for the 5th AMCDRR in Yogyakarta. The declaration also call on all Government and stakeholders to enhancing resilience at local level among others to promote comprehensive school safety.

The 2014 Bangkok Declaration, Annex I on Statement of Voluntary Commitments of Children, Youth and Child-Centered Organizations Stakeholder Group for the 6th AMCDRR, has adopted the Children's Charter for DRR, developed and endorsed by more than 1,200 children around the world that was launched at the UNISDR's Global Platform for DRR in 2011. The Children's Charter consists of the children's five priorities for DRR which include safe schools; child protection; information and participation; safe community infrastructure and 'building back better, safer and fairer'; and reaching the most vulnerable. The statement was promoted by children-centered agencies to raise the profile of children and youth, both as those affected by disasters and as agents for change in risk reduction and resilience building. Among the key targets for inclusion in HFA2 (Sendai Framework), the Education sector stated that no child dies due to disaster in a school built or modified after 2015; and number of school days missed as results of shocks or stresses is reduced by 50%.

In contribution towards the realization of these targets above, the stakeholder's group is committed towards creating a space at the regional level for discussion and sharing of technical resources, good practices/ lessons learned and model policies on safe schools to minimize the impacts of disasters to children's education; and coordinating and promoting the adoption, development and implementation of the Comprehensive School Safety Framework (CSSF).

Picture; 5th AMCDRR 2012 in Yogyakarta

3.6 Safe School related Programs

Many efforts have been done by Government, among others hosting and participating in Safe School international and national events. Beside the hosting and participated the 5th AMCDRR in Yogyakarta and participated the 6th AMCDRR in Bangkok as described above, the Ministry of Education and Culture participated and presented the Safe School updates in the events of , the first Safe School Leaders meetings in Turkey (2013), Worldwide Safe School Initiatives in Geneva (2014), Education Forum in Bangkok (2014), Presentation and participation at the Video Conference on Safe School Workshop in Tokyo organized by the World Bank (Dec 2014), UNWCDRR in Sendai (March 2015), Technical Workshop on Safe School in Tokyo (March 2015). The acknowledgement of international community on the progress of Safe School implementation in Indonesia and many times Indonesia was appreciated for its advance progress, this has boosting the Government of Indonesia further efforts to implement Safe School more seriously.

In 2014, 2011, the Government through the Secretariat for DRR in Education Sector which is at the same time manage the Safe School Secretariat and activities supported by UNICEF produced three Modules to implement the Comprehensive Safe School and produced a Roadmap for Safe School

In 2014, a pilot survey for Typology of School Construction in Indonesia was conducted and in 2016, Ministry of Education and Culture and BNPB developed a School Risk Map, these are as part of activity in the Roadmap, both are contributed and supported by the GFDRR/ World Bank through Global Program for Safe School.

Safe School Initiatives in Indonesia, Timeline 2010- 2016

Campaign and Socialization of Safe School	Implementation
1. National Campaign on Safe Schools and Hospital in July 2010 led by Coordinating Minister of People's Welfare following UNISDR campaign on One Million Safe School and Hospital (May 2010) 2. National Conference on Safe Schools (December 2010) 3. Identification of 75% of school buildings in Indonesia are located in disaster prone areas (2011)	Damaged Schools in Data System • Integration of data on damaged schools into the Dapodik/EMIS (2010 until now) Institutional • Establishment of the initial Safe School Secretariat (August 2011) • Institutionalized Stakeholders Coordination by National Secretariat Safe School • Development of National Secretariat for Safe School Blueprint by BNPB (2013-2014) • MoEC's Secretariat for Disaster Management was established at Bureau of Planning and International Cooperation, Ministry of Education and Culture (June 2014) • New National Secretariat for Safe School at MoEC (in process)

2010-2011	2011 – 2016
	Government's National Policies • Development of Guideline for Safe School using Education Special Allocation Fund or DAK (2011 for DAK 2012) • National Program on School Rehabilitation by Ministry of Education and Culture (2011-now) • Development of Guideline for Safe School and Madrasah or Perka BNPB No. 4 Year 2012 (May 2012). • Development of MoEC's Safe School Roadmap document (2015) Government Program and Activities • School Rehabilitation National Program (2011-now) • Pilot Implementation of Safe School in 180 schools, 3 provinces, 4 districts, 2 cities. (2012) Supported by GFDRR/World Bank (DRM and Education n Units) • MoEC - Australian Education for new schools Construction program for Junior High School (SMP)-2012-2014 • Moe – 15 Shelter School (2013) • Moe developed community based construction model and built 764 new safe schools in 28 provinces (2012-2013) supported by AEPI. • Conduct survey on typology School Construction in Indonesia (Dec 2014) • BNPB facilitated the adoption of Safe School/ Madrasah for 10 schools in 10 districts/ municipalities at North Aceh district, West Pasaman district, Bengkulu, Bandung district, Badung district, South Minahasa district, Bima, Ternate, Ambon, Gorontalo (Oct-Dec 2015) • BNPB facilitated Sister School program in disaster-prone areas in Sleman district. (Oct-Nov 2015) • MoEC preparing Roadmap of Safe School (2015) • School Risk Map supported by WB (2016) • Discussions on VISUS for School Assessment instrument supported by UNESCO (September 2015, 2016) • National Conference on Safe School: "Obtaining Commitment on Safe School in Relation with Sendai Framework for Disaster Risk Reduction" in Jakarta (September 2015)

	Participation of Ministry of Education and Culture, on behalf of Government of Indonesia in International Events • Hosted the 5th AMCDRR in Yogyakarta, Indonesia and hosted two events on Safe School (October 2012) • Joined the 6th AMCDRR in Bangkok, Thailand and presented Safe School(June 2014) • Attended the First Meeting of Safe School Country Leaders in Istanbul, Turkey (October 2014) • Joined the Regional Consultation Meeting on Education and Resilience in East Asia and the Pacific in Quezon City, Philippines (November 2014) • Joined the Tele-workshop on Safe School, Jakarta-Tokyo (December 2014) • Joined the technical meeting on the Istanbul Roadmap for the Worldwide Initiative for Safe School in Geneva, Switzerland (February 2015) • Joined the 3rd UN World Conference on Disaster Risk Reduction in Sendai, Japan (March 2015) • Attended the Technical Workshop on Safer School Facilities in Tokyo, Japan (March 2015) Participation of Ministry of Education and Culture in National Safe School Events • Participated in Safe School Working Sessions during National Commemoration for DRR Month events conducted by BNPB in NTB (2013) in Bengkulu (2014) and in Solo (2015).
2010-2011	2011 – 2016
	Training • Conduct training facilitator for Safe School from BPBD by BNPB (2015) • MoEC prepared 3 Module on Safe School for Comprehensive Safe School Implementation (Jan-June 2015) • MoEC trained 35 schools SMP for School Revitalization-Retrofitting (April 2016)

2010-2016	
	Results
	Data: • Inventory of Damaged Schools in 2010-2011; 2015 Organization: • The first National Secretariat of Safe School established at Ministry of Education and Culture (August 2011) • Blueprint for National Secretariat Safe School by BNPB (2014) • National Secretariat for Safe School concept (included in the Roadmap) developed by Ministry of Education and Culture Government Policies and Program • Guideline for School Rehabilitation for Disaster Resistance Building – Safe School for DAK 2012 (Permendikbud. 2011) • Perka BNPB No. 4 Year 2012 on Safe School/Madrasah • Roadmap on Safe School Implementation (2015) Training • 3 Modules on Comprehensive Safe School were produced, printed and distributed by MoEC assisted by UNICEF and used as training material. • More than 100 of Facilitators from BPBD were trained by BNPB (2015) cover 34 provinces. • 35 selected School junior high school (SMP) trained on Retrofitting for the School Revitalization Program (2016) • Socialization, Pilot and Facilitation: • Structural and non Structural: 180 School pilot (supported by WB) and more than 20 (supported by Plan Indonesia) • Non Structural: more than twenty thousand Schools from 60 institutions (Directory Safe School.BNPB) School Risk Map • School Risk Map with data PDSP December 2015 is available (April 2016)

3.7. Safe School Stakeholder Collaboration

Reducing the risks of natural hazards and preparing for disasters requires collective action. Disaster risk management stretches across many horizontal sectors, such as social, financial, economic, water, energy, and infrastructure, and the vertical private and public sectors. This necessitates coordination among the actors, such as ministries and economic entities.

Moreover, many stakeholders are involved. From the local and municipal levels to the regional and global levels, actors such as non-governmental and community organizations, those from the public and private sectors, and international organizations need to work together. A strong institutional basis for coordinating and implementing effective disaster risk management is crucial.

In effort to build coordination among the government institution towards formulation of an orchestrated implementation has its own challenge. The overlapped programs and fragmented development system have led to different objectives and implementations of the safe school program.

In dealing with this issue, the effort conducted by GFDRR is to push the importance of the coordination among the sectors involved. GFDRR works together with the line ministries with mandate in education and disaster and various stakeholders through technical assistance and support to the National Secretariat for Safe Schools. All of them have programs related to safe school but lack of coordination. The programs implemented by the respective line ministries and agency has not been on the same direction in terms of objective of education development in Indonesia.

Ministry of Education and Culture Ministry of Education is responsible for the implementation of the education process in Indonesia, including the formulation of curriculum, mechanism, norms standard, procedure, and criteria. In safe school program, the ministry is responsible for the integration of the safe school initiative principles into the education system and mechanism of Indonesia. In pushing this agenda, the various stakeholders support the ministry in form of technical assistance. The following are the supporting stakeholders from various institutions.

National Agency for Disaster Management. Dissemination of disaster information to various government stakeholders has been conducted. National Agency for Disaster Management conducted the coordination of disaster-responsive programs in line ministries toward risk-informed decision and policy making in respective ministries. Provision of risk map, disaster data and baseline toward achieving the risk-informed decision and policymaking has also been conducted. In local level, the agency closely coordinates the disaster management efforts with local disaster management agency in 34 provinces and more than 450 districts.

Ministry of Religion Affairs. Being responsible for the provision and formulation of the norms, standards, guidelines and criteria of the operation of Islamic schools in Indonesia, the Ministry of Religion Affairs have been active in the implementation of safe school agenda. The safe school standards and principles have been adopted and disseminated to more than 7000 Islamic Schools in Indonesia. In evaluation and monitoring side, the Ministry also adopted the tools developed by Ministry of Education.

Ministry of public works. Being responsible for the formulation of the building codes for construction of the earthquake-resistant state building. School as stipulated in the regulation is the state building. Ministry of Public Works is also tasked to supervise the construction of schools and to implement the evaluation and monitoring the maintenance.

Ministry of Home Affairs. In decentralization system in Indonesia, the Ministry of Home Affairs has role to ensure the implantation of the program in local government through supervision mechanism. This huge role is fundamental in pushing the agenda of the safe school to local government. The role of the Ministry of Home Affairs in safe school initiative can be in formulation of the implementation of safe school guidelines and funding mechanism in local budget.

Government of Australia. Government of Australia (DFAT) have provided technical assistance to the Ministry of Education and Culture (MoEC) school building program for approximately 1200 schools since 2010. DFAT identified quality of design and construction as their key concern and centered their technical assistance on the provision of a quality assurance team. DFAT developed a checklist and guidance of information to be gathered of the proposed site for a new school. DFAT also developed thorough quality assurance checklists containing well-illustrated seismic construction details. This guidance appeared to be used exclusively on the DFAT supported schools but could also be used to improve the quality assurance at larger scale.

International Non-Governmental Organization. Plan International and Save the Children are involved in school safety initiatives targeting pillars two and three of comprehensive safe school, namely school disaster management and risk reduction and resilience education areas. Other NGOs and INGOs continue to be involved in education infrastructures in Indonesia, but the MoEC have indicated that their potential impact at scale is typically fairly limited.

KPB or Consortium for Disaster Education. Consortium for Disaster Education (CDE or KPB) was established in October 2006 as a follow-up of the International Risk Reduction Day 2006 with the theme: "Disaster Risk Reduction Begins at School." The main specific aim of CDE is to support the development of sustainable policy and DRR education practices at national and local levels through formal, non formal, as well as informal approaches by improving the capacity, coordination, and synergy among parties and making the commitment for DRR education. The consortium is open to all interested agencies and membership is on an institutional basis. Board members represent a mix of UN agencies, Indonesian and international NGOs, the Red Cross and LIPI (the National Institute of Science).

Asean Safe School Initiative. Ten ASEAN countries including Indonesia in 2009 have signed regional ASEAN Agreement on Disaster Management and Emergency Response (AADMER). The ASEAN Safe School Initiatives (ASSI) project aims to support the implementation of the school safety components of the AADMER Work Programme and the Asia Pacific's initiative on One Million Safe Schools. ASSI project is implemented in four countries: Cambodia, Laos, Myanmar and Indonesia. In Indonesia, AADMER Partnership Group (APG) which consists of Plan International Indonesia, World Vision International and Save the Children, is developing a partnership to support ASSI development and implementation in Indonesia

UNICEF[1] . In 2010, The United Nations

[1] Sourced from "Towards Safer Schools – Methodol-

Children's Fund (UNICEF) and the United Nations International Strategy for Disaster Risk Reduction (UNISDR), the Secretariat for ISDR initiative, jointly developed a multi-dimensional analytical framework and a methodology to assess school safety – as a follow-up to the conclusions of the 2009 session of the ISDR Global Platform, which stated: "It was proposed that by 2011 national assessments of the safety of existing education and health facilities should be undertaken, and that by 2015 concrete action plans for safer schools and hospitals should be developed and implemented in all disaster prone countries". This goal was established as part of a wider national and international effort to reduce vulnerabilities and build resilience of communities, which will save the lives of many boys and girls, men and women.

The scoping study Assessing World-wide Progress on School Safety was released in June 2010. The study proposes that the safety of each individual school is assessed through 17 indicators grouped under four main dimensions. In 2011, UNICEF developed a methodology for the nationwide assessment of school safety at an individual school level. In 2012, in partnership with UNESCO, UNISDR, Save the Children and Plan International, UNICEF formed the Asian Coalition for School Safety (ACSS). Through ACSS, UNICEF has advanced the three pillars of Comprehensive School Safety Framework.

In Indonesia, begin from end of 2014 UNICEF provides technical support for MoEC related to Education Sector Disaster Management through Education in Emergencies program, and part of this program is to support Safe School program.

ogy for Nationwide Benchmarking of School Safety, UNICEF Central and the Commonwealth and Eastern Europe of Independent States, 2011.

UNESCO. Since 2006, UNESCO in Indonesia has started working on Disaster Risk Reduction issues. Later in 2015, working together with University of Udine in Italy who has developed VISUS method (Visual Inspection for defining the Safety Upgrading Strategies), UNESCO starts to adopt VISUS method for Indonesia context and pilot tested this method at 50 schools in Bandung district and 10 schools in Pangandaran District – both are part of West Java province. For 2015 activities, UNESCO used their own funding, but for 2016, UNESCO also received funding GFDRR.

VISUS aims to assess schools using a holistic and multi-hazard approach that considers five issues: site conditions, structural performance, local structural criticalities, non-structural components and functional aspects. Each issue is analyzed using a pre-codified expert approach that splits the assessment into two main steps: the characterization and the evaluation. Simple graphical indicators summarize the evaluation, pointing out the main weaknesses and the needs for intervention.

Safe School National Secretariat. On 25 August 2011, National Secretariat for Safe School was established. This National Secretariat reported directly to the Vice Minister for Education and Culture and was managed by Kerlip (local NGO). The World Bank funded a personnel and the operation cost of the Secretariat. However, on 2013, the National Secretariat for Safe School was handed over to BNPB and between 2013-2014 BNPB tried to develop Blue Print for National Secretariat for Safe School.

Later, in October 2014, during the DRR month commemoration at Bengkulu province, BNPB handed over the National Secretariat for Safe School back to the Ministry of Education and Culture (under responsibility of the Bureau for Planning and International Cooperation, Secretariat General). During 2015, the Bureau for Planning and International Cooperation supported by UNICEF developed Indonesia Safe School Roadmap together with all education stakeholders in which institutionalization of National Secretariat for Safe School was addressed. In 2016, the responsibility of managing National Secretariat for Safe School is under the Directorate of Special Education and Special Services, Directorate General for Basic and Secondary Education.

The wide range stakeholders of Safe Schoolwork are the strength gained to continue working and create new ideas on Safe School. Currently there are more than 50 institutions involved in Safe Schools and more than 3 platform (KPB, Planas, MPB etc.) working in Safe schools. Most of them are working on non-structural issues, emergency response in education sector, while for the structural issues are only few players (World Bank, UNESCO, Build Change and Plan Indonesia). The other players are as seen below. There might be several actors are not mentioned there due to too many and space is limited, those are not there among others ASSI, Asian Safe School Initiatives that collaborate with Plan International/Indonesia, Build Change, an NGO who supported the structural issue initially for houses only, and later for school as well.

Chapter 04

Safe School Initiative Implementation

4.1. Mainstreaming DRM in Education Sector

Effective mainstreaming of disaster risk management is a complex task. It involves working in the short and long-term, working in strategic papers articulating risk reduction across development policy and planning, down to individual communities undertaking simple risk assessments and making preparedness to manage hazards. There is work to be done in policy and technology, politics and advocacy, and public awareness.

The basis for the Bank's involvement in the development of Indonesia's DRM systems relates to its ability to leverage existing engagements and financing instruments and its access to international best practices that will serve as the foundation to support the building of a disaster and climate resilient Indonesia. The policies, budget allocations and institutional capacities required to achieve this will be developed through: i) mainstreaming DRM into regular development initiatives; ii) building the capacities of DRM institutions and governance; iii) implementing comprehensive risk financing and insurance policy framework; and iv) linking DRR, climate adaptation measures and area-based resilient development.

The World Bank in pushing the agenda of Safe School Initiative, collaborate with Ministry of Education in ensuring the risk-based approach can be integrated in education sector. The safe school initiatives as part of the global and national campaign, was the initiative that could fit the strategy and program of Ministry of Education and Culture. In operational level, the World Bank in collaboration with various stakeholders, worked to influence the government on implementing the safe school standards and principles in its program and strategy. The operationalization of this concept was through integration of the safe school initiative in government school rehabilitation program funded with Special Allocation Fund (DAK) mechanism.

4.2. Pilot Safe School Project Implementation

Post the issuance of Regulation of Head of BNPB Number 4, in May, 2012 on Guideline for Safe Schools/Madrasah from Disaster (Perka BNPB No. 4/2012), the Vice Minister of Education, Ministry of Education and Culture requested support to the World Bank to piloting the implementation of Safe School Guideline in Perka BNPB No. 4/2012. The guideline was issued by Perka BNPB No. 4/2012 but launched by the Minister of Education and Culture on the National Education Day in May 2012. This reflected very good coordination between the two major government institutions for managing Safe Schools.

In 2012-2013, the World Bank with funding from the GFDRR and Basic Education Capacity Building Trust Fund (BEC-TF) conducted pilot project to provide community facilitators to assist school managed rehabilitation project in 180 schools to implement Safe School Guideline issued by the National Agency for Disaster Management (BNPB). The Safe School Guidelines included both retrofitting technique for earthquake resistance, and school disaster preparedness to raise awareness and culture of safety. The Safe School Pilot focused on school rehabilitation where the capital expenditure was allocated through the DAK independent of the facilitators' contract.

A preliminary survey of the impact of this pilot suggests that school managed rehabilitation can also lead to Safe School given the proper timing of technical assistance and advisory provided by the facilitators relative to the timing of the DAK disbursement. It is important to note that both DFAT and World Bank supported initiatives recommended the importance of considering not a one-size standard/ blueprint to cater to varying needs of different schools, and the useful addition of technical advisory assistance (as means of empowerment) provided to schools during the construction process.

The above consistent recommendations were deemed proven in addressing the weak risk awareness and poor construction practice and compliance to standard, which were the underlying factors of school vulnerability in Indonesia. The challenge moving forward for Indonesia, however, is not to simply replicate a new construction or rehabilitation program which is dedicated to building safe school, but rather to institutionalize the proper construction, maintenance, upgrading/retrofitting and school safety practices through more explicit policy and procedures, as well as empowerment of existing local extension and community advisory services to support local implementation of safe schools across the country.

Structural retrofitting, for example, although is proven to be cost effective and easily implementable by local masons, is not yet explicitly required by the existing procedures because of perception that is case-by-case specific. Similarly, the use of facilitator type of technical assistance expert is not prohibited, but it was not part of the standard implementation modality where its budget is allocated and/or required.

Pilot Project's Locations and its Criteria. Totally 180 Elementary School (and Junior High School) from three Province in Indonesia: West Sumatera (Padang City and Padang Pariaman Regency), West Java (Bandung City and Bandung Regency), and West Nusa Tenggara (East Lombok Regency and West Lombok Regency). Those Cities and Regencies having high or medium risk of earthquacke and tsunami (except for Bandung city and Bandung Regency, no tsunami risk).

Schools of *pilot project,* were the Elementary Schools which listed on Ministry of Education's list of Dana *Alokasi Khusus* (Special Allocation Fund) beneficiaries, year 2012, for Elementary schools (except for West Lombok regency and East Lombok regency, according to the *Bupati* request: three junior high schools had included as pilot's locations).

With the assisstance of Local education ministry officials, the shotlist of the pilot project's schools assigned with several considerations:

- Area distribution (represented all *Kelurahan/ Desa* in each cities/ regencies)
- Different geographical conditions (beach area, flat, mountains)
- Represent schools from remote areas

Focus of Pilot Project. In accordance

Perka BNPB no. 4 year 2012, Safe School assessment includes two main aspects, namely the structural (school buildings / structures, school architecture, school lay out, and utilities) and social/non-structural (school policy, resource mobilization, planning, disaster preparedness).Those two aspects became focus of the pilot project. Therefore the facilitator divided into technical facilitator to provide structural aspect assisstance, and social facilitator to provide non-structural aspects assisstance.

To monitor progress reached, each aspect analyze by some parameters as follows: Structural aspect include building structure, architecture, Layout, and Utilities. Non-structural aspects are: knowledge, attitudes and actions, policies that support the achievement of a safe school, resource mobilization, and a plan that supports the achievement of safe schools

All parameters consists of several indicators. Totally almost 48 indicators (most from PERKA, with several additional from project), to prove the progress of the safe school achievement.

Project Stakeholders. In general, the rehabilitation of primary school buildings in the pilot sites will be developed following an school-based management. These processes will be conducted jointly with the involvement of various stakeholders, at school level (students, teachers, school committees and the District Bureaus of Education) and city/ regency level (District Education Office, District Disaster Management Office, Education officers in sub-District level). All activities facilitated by facilitators who have competencies in advocacy, awareness campaigns and facilitation, as well as the facilitators who have competence in civil engineering (infrastructures building).

Timeline. The Pilot Project assisstance coverage Provinces of West Sumatera, West Java, and West Nusa Tenggara from July 2012 – February 2013.

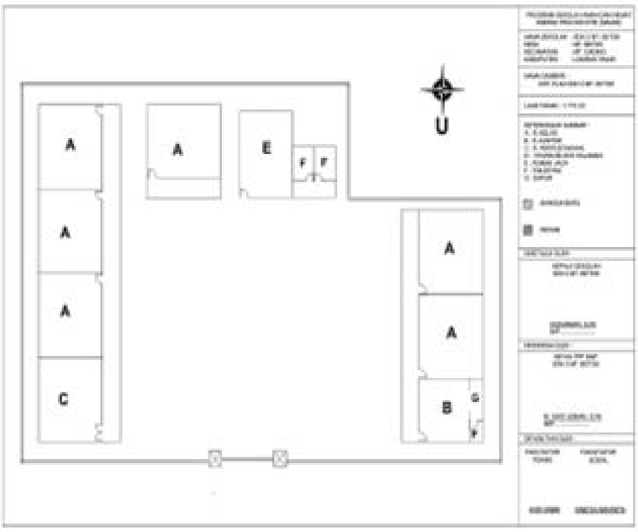
Facilitation Process. Facilitation had been done in the planning, implementation and monitoring evaluation process both of structural and non-structural components through the participatory approach. The facilitators worked with key actors at school community level and stakeholders at district/city level.

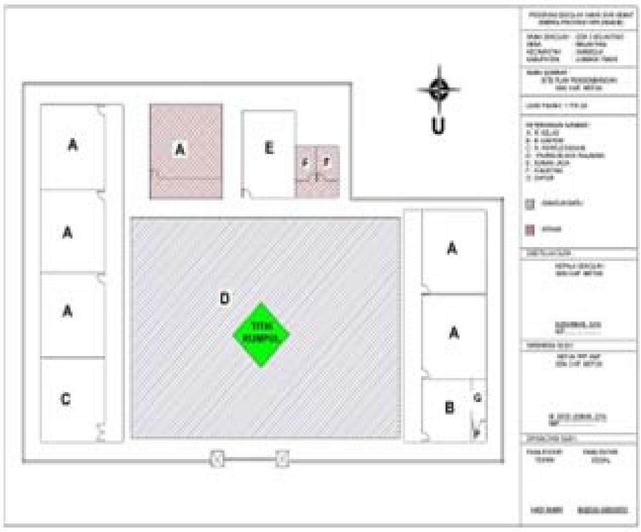
The first step of this project was training and socialization for the school principals in the district/city level. These activities purposed to increase knowledge and awareness of the school principals on safe school and disaster risk management.

In the school level the process had started to establish of the Anti-Disaster and Safe School Committee (Komite Bencana dan Keselamatan Sekolah, KBKS) in West Nusa Tenggara and organized existing school community organization such as Pramuka and UKS in West Java and West Sumatera. The KBKS /School community organization comprehends series of task forces, such as: school rehabilitation and development awareness campaign, Disaster Awareness Team, Energy committee, etc., depends on the schools need.

The next stage facilitated by the KBKS/ school community organization, this comprise of designing the planning documents such as below.

- Assessment of structural and non-structural components
- Model of Safe School which adopted to the School Master Plan and Safe School Medium Term Plan (Rancangan Perencanaan Jangka Menengah Sekolah Aman/RPJMSA) for 5 years period in the form of drawing and/or mock-up.
- The Detail Engineering Design (DED), and financial plan (RAB) for class





rehabilitation using the DAK fund 2012.

- Action Plan 2012/2013 which contains capacity development for disaster readiness by making the Standard procedure for Early Warning System and Evacuation, Evacuation Simulation (Training), making the Evacuation Map, students and community awareness campaign, and the Standard procedure for school maintenance.
- Building and Development phase in the implementation comprised of two rehabilitation stages, including structural and non-structural components. In this stage KBKS/school community organized implementing of 1st year action plan. The purposed of this stage was rehabilitation based on DED, Operational Standard Procedure of Early Warning System and Evacuation, Evacuation map, awareness campaign, evacuation training would have done.
- Awareness campaign and training executed through teaching and facilitation process depends on the target group. The teacher and the school principal awareness campaign conducted through formal and informal discussion. More intensive campaign carried out to the KBKS members in planning and implementation process. Students' awareness campaign implemented through games and competition suitable with children. For example: singing, drawing, and storytelling. The themes related to disaster issues such as earthquake and tsunami, as well as the safe school concept. These activities were encouraging students to understand the issues better.

Actor's knowledge and attitude had been increased then actor-to-actor campaign happened such as:

- Ali Syahid, KBKS coordinator at Sembung Primary School, East Lombok has been campaign to PGRI (Teachers Union) members.
- Sri Yuliasih , the principal of Cijerokaso Primary School, Bandung city and Neni Nuraeni, the principal of Mekarwangi Primary School, Bandung district have been campaign to other principals primary school in the meeting.
- Nurmansyah, Head of School Committee of Primary School 02, Padang City has been campaign to Pasar Gadangs' Primary School 04 and 11 even primary school 11 didn't include DAK's beneficiary.
- The Students informed their parents the safe school activities at school.
- Some schools invited community to attend evacuation training.

Some schools willing to add disaster issues in the curriculum, both in class or extra curricula like at Kresna , Cijerokaso and Sembung Primary School. Syamsuhaidi, head of Education Office of Lombok Timur District stated that integrating disaster issues to school curricula is needed with the local content.

"I understand more about retrofitting techniques after the facilitators showed some pictures. I want to implement the technique at my own house because I'm currently doing rehabilitation. I also want to inform the mosque development committee at my village, so that they can use the retrofitting techniques" (Halimatussadiah, teacher of Anjani Primary School).

The project and school community including stakeholders at city/district level has done monitoring and evaluation. Monitoring implemented through different level 1) routine monitoring by visiting the pilot schools, this activity done by province coordinator and Team leader; 2) online evaluation monitoring using the monkey survey system; and 3) Participatory monitoring that involving stakeholders at district/city level and KBKS. The stakeholders involved at district/city level are Local Development Board (Bappeda), The Public Works Office (Dinas PU), Education and Cultural Office (Dinas Pendidikan dan Kebudayaan), and the BPBD. Instrument of monitoring based on the indicators, which used in this program, including the structure that refers to the Ministry Public Work policy (Permen PU 2005).

Participatory evaluation implemented through FGD at KBKS/school community level and workshop at district/city level. In this event participant have been discussed what condition that found from the monitoring and follow up action for the next step.

Retrofitting techniques were applied in the pilot schools rehabilitation.

4.3. Influencing Government Financing Scheme (DAK).

There were some modification in Government Financing management both of on implementation and planning. Financing management in school level had changed before and after the intervention. In previous were limited transparency in allocation and implementation of DAK. This problem was cause of misused fund such as lower quality of building materials, expenditure some materials that not included on building structures. Through participatory approaches in this program was increasing school community involvement such as the parents, village leaders, students, and teachers on the planning and decision making. Through community workshop the principal and team must have opened the budget to the audience, making planning together and it means the transparency happened and the quality of the building had been increased.

Submission of DAK proposal for school rehabilitation is done by the District Education Office to Ministry of Education. The District Education Sectors collect the data schools in different way such as from the sub district education officers, from the planning consultants, and also from the principals. There were no accurate data about the school damage and planning that should have used as reference for District Education Office to select the schools. In some cases that problem causes some mistake in the decision making and the DAK of rehabilitation gone to the school that not really needed rehabilitation. This problem was reveal in the final workshop at East Lombok and West Lombok. The District Education Office would have changed the scheme of submission. The schools which attached the RPJMSA (Mid-term planning of Safe School) in their proposal would be priority for the next DAK.

Another source of the budget for safe school reveal on APBS (routine school budget), APBD (Local government budget), and also some schools had had fund from the school community. Karyawinata primary school in Bandung district had gotten the budget from APBD around one billion IDR for 3 classes. In Padang and Padang Pariaman some international and national organizations and companies, also became valuable resources for school rehabilitations.

Project Achievement and The Recapitulation of Achievements Indicator

Based on the category developed in the PERKA BNPB No 4/2012, the analyses of the initial/ baseline condition of the 180 pilot's schools base on this criteria.

The first category refers to the schools which meet at least 1 structural and 1 non structural aspect. The second category for those schools which meet at least 2 structural and 2 non structural aspects. And the third category devoted to those schools that meet all aspect of the structural and non structural aspects. According to the PERKA, the baseline condition of 180 pilot schools as folow:

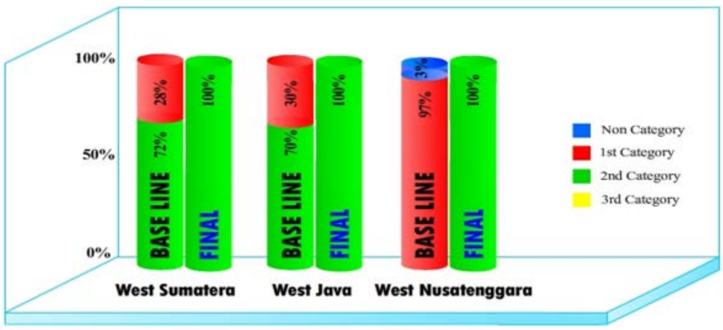


Figure # Comparison of Pilot Project's School Condition Before and After Project, According to PERKA's Category

In West Nusa Tenggara experience, The baseline graph above shows that none of the pilot schools meet the expected standards, the highest precentage of the pilot schools are in the first category (97%). This means that the team need extra efforts to achieve the safe school program in the pilot schools. As a result, at the end of the SEES program implementation, most of the school have met at least some of the PERKA standard. The category 1 for example, decreased from 97% to 0%. On the other hand, the school in the second category, sharply increased from 0% to 100%. This means that all of the pilot schools moved from lower to higher category.

West Sumatera, at the beginning of the project, has better condition. Because they have an experience with earthquake on 2009. Response for the disaster, many program from government or non-government support school building rehabilitation and preparedness aspect. West Java, especially in Bandung Regency, had already finding DAK's fund at the beginning of the project (several schools had already renovates the building before the project began). That's why, they also have better initial condition than West Nusa Tenggara.

Generally, in all pilot's schools it can be concluded that all assisted schools have met the requirements of 2nd category. However, none of the pilot schools meet the 3rd category because of some reasons: 1) The facilitation of structural components put more emphasized on architectural and building structure based on the Rehabilitation DAK fund 2012; 2) There are only 20% to 30% classrooms rehabilitated; 3) the process of facilitating non structural components needs more time, especially designing the safe school mid term plan (RPJMSA), Operation Procedure Standard (SOP) and the simulation process.

According to the Team experiences during the need assessment stages, PERKA's method will become sharpened if the analyses more details. Details of structural and non structural indicators will give more information on the pilot schools condition. The initial assesment developed details indicators and categorized the schools based on 3 different scales poor, middle and high as described below:

Component	Number of Indicators Achieved	Category
Structural	0-10	Poor
Number of Indicators = 34	11- 21	Middle
	21-33	High
Non Structural	0 – 4	Poor
Number of Indicators = 14	5-9	Middle
	9-14	High

According to PERKA's indicators, the project adopted it become project indicators as described by graphic below:

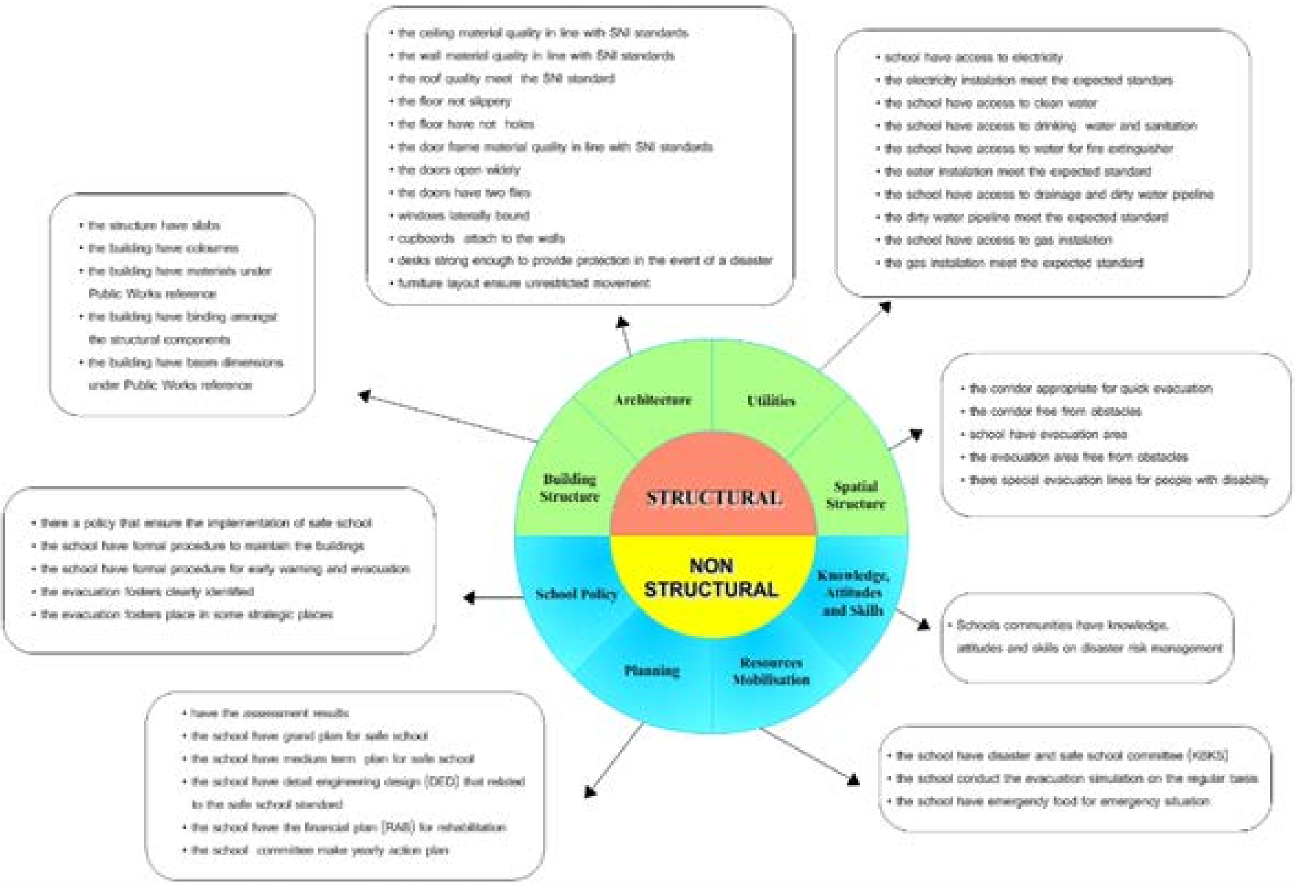


Figure # Parameters and its Indicators of Safe School

The indicators lead the project to identified school's conditions, categorize it, and deliver proper treatment for each pilot's schools. The indicators also become monitoring and evaluation's indicator, to control progress of the project.

The final achievement of the pilot project can be present in general as follow. Notes, for parameters of: knowledge, Attitude and Action, more present as qualitative data. Several quantitative result, inserted in to Resources Mobilizations.

While in architectures, the strong points were usage of standard materials of ceiling, floor, and furniture. One thing from architectures that commonly didn't follow by most of the school was: the door didn't open widely to the outside direction instead inside..

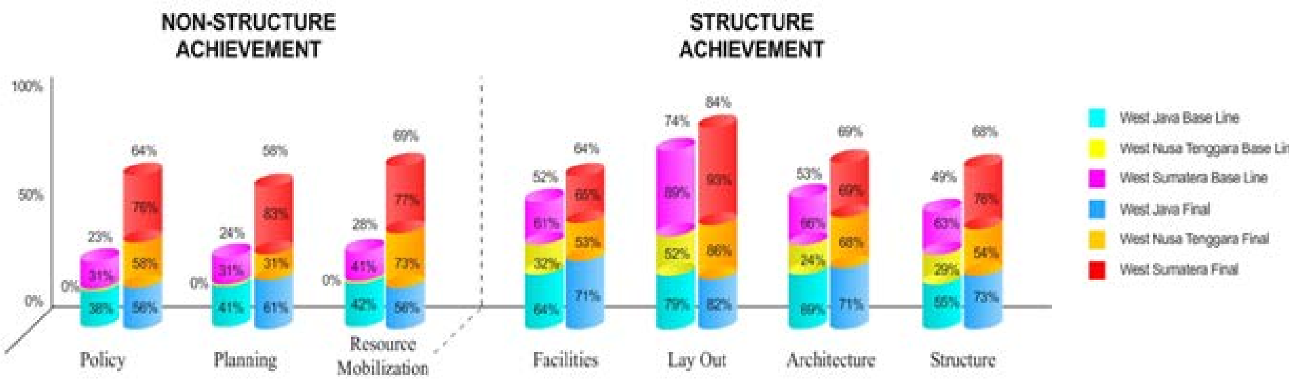


Figure # Comparison of Baseline Condition and Final Achievement of Safe School Pilot Project in 180 Schools

According to the graphic above, the project gave more impact on Non-Structure Aspects. The achievement was significant. Some strong points that contributed the most were: formations of KBKS (School committee for disaster readiness), implementations of emergency evacuations procedures regularly, and formulation of safe school's master plan document. In Policy parameters, all school had develop SOP of early warning system, and operational and maintenance's plan of school building.

In Structural aspects, the project gave significant progress in architecture and structures. In structures, usually the strong points was on retrofitting implementations, adding slopes, ring beam, column. The builders' capacity and skill is the key in application of retrofitting technique. The builders worked at the front line, they are strategic group to implement the retrofitting technique in building rehabilitation

The right campaigning approach and method encourages understanding, awareness, and participation from school communities. The campaign methods should be used appropriately based on the target group characteristic. This will increase the capacity and the awareness of the stakeholders involved. For example, the campaign for the students is more acceptable by utilizing games and attractive competitions. For the teachers formal and informal discussion considered as effective campaign method. And for the decision makers the campaign method will be more effective when they are positioned as a resource person, Monitoring and Evaluation team and other activities related to their positions

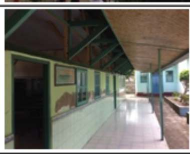
4.4. Indonesian School Infrastructures Typology

In cooperation with Arup International and support from Global Facility for Disaster Reduction and Recovery (GFDRR), a survey on school typology in Indonesia was conducted. The survey process involved the site visit to a total of 21 schools to gain an understanding of the different construction typologies and vulnerabilities 9 schools around Padang, West Sumatera and 12 schools around in Lombok, Nusa Tenggara Barat.

Key stakeholder consultations included national and district government departments, school teachers, engineers, contractors, academics, donor organizations and INGOs, was also conducted. The schools were chosen to represent a variety of typical school facilities in terms of the school size, construction typology, building condition and exposure to hazards. The data collected during the school visits was used to conduct a rapid visual assessment using FEMA 154 on at least one building from each school.

The purpose of this assessment was to obtain a high level understanding of the vulnerability of school infrastructure in Indonesia to earthquake risk. The objective of the survey was formulated as follows:

1. To understand the range of hazards and drivers of risk that may compromise the planning, design, construction, repair and retrofitting, and operation of school infrastructure projects.
2. To understand the number and construction typology of existing schools in Indonesia, including the number of damaged schools, and those that will be constructed.
3. To understand the current safe school practices in Indonesia, which relate to in disaster preparedness, repair, rehabilitation and retrofitting.

Building Typology	#	Photo	Advantages	Disadvantages
Unreinforced masonry (Inpres programme)	30%		• Easy to build • Durable	• Wall panels unrestrained (No ring beam and / or stiffener columns) • No seismic design
Confined masonry - concrete frame with masonry walls anchored to frame (Government model)	50%		• Seismic resistance if constructed properly and best practice details are followed • Durable	• Large openings compromise stability and do not follow best practice details • Complex rebar detailing
Concrete moment frame with masonry infill panels (e.g. JICA Shelter schools)	10%		• Seismic resistance • Durable • Allows large openings in walls	• Masonry façade may not be tied in • Very complex seismic reinforcement detailing
Timber haunched frame - half height unreinforced masonry walls on raised plinth (e.g. 1940s)	5%		• Lightweight is good for seismic • Easy to build • Quick to build	• Untreated timber susceptible to insect attack and weather degradation • Unrestrained masonry panels
Light steel frame with asbestos shear panels (Empress programme)	5%		• Lightweight is good for seismic performance • Easy to build • Quick to build	• Untreated steel will corrode if not well maintained • Asbestos – issues with damage / removal

(Arup Report, 2014)

4. To understand the institutional environment and regulatory framework within which school infrastructure is planned, designed, constructed, operated, maintained, repaired and retrofitted in Indonesia.
5. To make recommendations to the WB country task team to prioritize the GPSS investment for a structural resilience program of construction and rehabilitation for public schools facilities.

Construction Typology of Surveyed Schools

Unreinforced Masonry. Unreinforced Masonry is the most vulnerable construction typology seen during the field mission. Many of the unreinforced masonry schools visited were more than 30 years old, and were not adequately maintained or repaired following damage. This increases their vulnerability to future events; for example, cracked walls have less capacity and are less stable during subsequent earthquakes.

Confined Masonry. Confined masonry consists of masonry wall panels (unreinforced) anchored into reinforced concrete stiffener columns at regular intervals with a concrete ring beam at the top of the wall. Confined masonry is more complicated to build than unreinforced masonry as it introduces reinforced concrete into the masonry wall panel. The reinforced concrete elements are often small and can be difficult to achieve good quality workmanship as seen on some sites during the school visits. The concrete can be difficult to compact, often resulting in air voids and exposed reinforcement which compromises the durability and capacity of the building structure.

Concrete Moment Frame. Two of the schools we visited had buildings constructed using reinforced concrete moment frames with infill masonry wall panels. SND 23, 24, Kota Padang, was a 3 story tsunami shelter built by JICA (Japan International Cooperation Agency) on the coast of Padang. Another double storey classroom block was seen under construction in Padang. Moment frame construction is often more expensive to build than unreinforced or confined masonry, and requires a high level of quality control to ensure the concrete frame is constructed with special seismic and moment connection reinforcement detailing, which is often unfamiliar to local construction teams. The infill wall panels are not required to provide stability which means larger window openings can be provided. However, the wall panels must be detailed to prevent them falling out during a seismic event.

Timber Frame. The timber frame school we visited was constructed using an engineered haunched frame with low level masonry infill walls allowing for large window openings. This lightweight frame performs well in a seismic event because there is little mass to excite, and the structure can accommodate movements without being damaged. The building was generally in good condition for its age (over 70 years old), although some of the timber elements had degraded significantly from insect attack, and these should be removed and replaced with new treated timber. It was not clear if the masonry infill panels were connected to the surrounding timber frame (e.g. through protruding nails or similar). If not, there is a risk of local collapse of the masonry infill panels in a seismic event.

Steel Frame. Similar to timber frame buildings, this lightweight form of construction is less excitable during an earthquake and therefore less vulnerable to damage than a heavier masonry building. The steel sections were badly corroded due to the age of the building and lack of maintenance and treatment. The panel walls were asbestos which can be extremely hazardous to health if the dust from the material is inhaled.

4.5. Safe School Risk Mapping

The school risk map factoring the earthquake is based on the fact that more than 80% of areas in Indonesia is prone to earthquake as reported by National Agency for Disaster Management. In last 10 years, the occurrence of the earthquake is more frequent with various scales. This present risk to the population and if not addressed, the potential loss to lives and assets will damaged and in long run causing more massive loss.

The risk map development started in July 2015 and presented in a focused group discussion in September 2015 to agree on the parameters utilized. The discussion was attended by sectors including National Agency for Disaster Management, relevant Directorates of Ministry of Education. In October 2015, the second discussion was held in Jakarta and attended by Ministry of Education and Culture, coordinated by the Safe School Secretariat, Planning Bureau of Ministry of Education and Culture and attended by head of sub-directorates of Elementary, Junior High, Senior High, Vocational, Special Need and Early Childhood Education. The objective of the second discussion was to review the parameters utilized.

The Director General is interested in the utilization of the school risk map to prioritize program in disaster highly earthquake prone area, especially rehabilitation of the damaged schools and classrooms, new-classroom construction priority determination, using retrofitting methods. This also includes the non-structural activities such as standard operation and procedures for evacuation, in particular for schools located in highly disaster prone areas.

The detailed objectives of the school risk map development is to identify the districts, cities requiring the special attention in education facility rehabilitation and reconstruction toward the achievement of safe school initiative in Indonesia as formulated below:

- To provide the national scale risk map presenting the distribution of districts and cities with earthquake highly prone area and information of vulnerable schools if earthquake occurs,
- To provide spatial based baseline data capturing the level of earthquake risk to schools in district and city level as reference to safe school priority determination,
- To provide risk map for district and cities describing information on school location distribution with high earthquake risk for monitoring of safe school progress in the respective areas.

The risk map also helps the Ministry of Education and Culture in policy making related to education sectors, priority program determination and the implementation of the programs. The map also helps Ministry of Religion Affairs in policy making and monitoring mechanism development of Islamic schools, managed and monitored by the ministry.

Ministry of Religion Affairs manages almost more than 7200 schools Islamic Schools in Indonesia with school population more than 350,000 consisting of teachers, students, and supporting personnel. This is a huge assets that their safety must be ensured. Using the school risk map, the Ministry of Religion Affairs can also determine if the location of the school is in earthquake prone area.

RISIKO KAB/KOTA	Jumlah Kabupaten	Jumlah Kelas	Jumlah Sekolah	Jumlah Guru	Jumlah Murid	Jumlah Sekolah	
						Usia Bangunan < 1980	PGA Tinggi
RENDAH	77	219.147	27.745	369.332	6.191.650	347	0
SEDANG	153	420.363	55.873	693.312	10.826.567	5.571	254
TINGGI	275	712.719	95.655	1.189.178	18.065.826	52.648	7.467
Grand Total	**505**	**1.352.229**	**179.273**	**2.251.822**	**35.084.043**	**58.566**	**7.721**

It is expected that with the availability of the risk map, the following can be achieved:

- The clear picture of school location in earthquake prone areas
- The concise approach and focus in managing the school with highly earthquake prone schools
- The concise intervention and programs with adjustment to the requirement to reduce the risk identified structurally and non-structurally.
- Realization of the safe school and madrasah in Indonesia.

4.6. Government Program Initiatives on Safe School

The uniqueness of working on Safe School issues in Indonesia has been recognized as great collaboration among stakeholders either cross sector ministries, NGOs, academician, international development partners, as well as media. It was influenced by huge collaboration of various organizations in DRR created after 2004 Indian Ocean earthquake and tsunami. As part of the preparedness for DRR, a Safe School global campaign given direction was conducted by UNISDR in May 2010, this was followed by a National Safe School Campaign led by Coordinating Ministries for People's Welfares accompanied by Head of BNPB, Minister of Health, and Vice Minister of National Education in July 2010 organized by National Platform for DRR involving wide stakeholders as mentioned previously, including schools.

Several Indonesian organizations that are actively working on disaster have also involved and work in the area of Safe School, e.g. CDE or KPB, MPBI (Indonesian Society for Disaster Management), Planas (National Platform for DRR), which each of them has more than 50 members. Now, all of them are included in the Education Cluster coordinated by Ministry of Education and Culture supported by UNICEF.

The main players of Safe School which have done some pilot and facilitated central government, local government and schools are ASSI (consists of Plan International Indonesia, World Vision International and Save the Children), CDE, Kerlip, World Bank, UNESCO, and UNICEF. At the government level, Ministry of Education and Culture, BNPB-National Agency for Disaster Management, Ministry of Home Affairs, Ministry of Religion, Ministry of Public Works especially Directorate General of Cipta Karya, local government institutions (Provincial/District/Municipality) Education Office, BPBDs (Local Disaster Management Agency at provincial and/ or district/ municipality).

Disaster Management Secretariat of Ministry of Education and Culture. June 2014 – Ministry of Education and Culture formed MoEC's Secretariat for Disaster Management (MoEC's DM Secretariat) – under the Bureau of Planning and International Cooperation, Secretariat General's responsibility. The main function of MoEC's DM Secretariat, which consists of all MoEC's Key Units' representatives, are to coordinate MoEC's Key Units and external parties (UN agencies, local/ national NGOs and International NGOs) related to activities of preparedness, emergency response and post-disaster for education (and culture) sector, to develop policies, strategies, and 2015-2019 action plans related to education sector's disaster management program; and also to perform the education cluster coordinator function as MoEC has been formally appointed by GoI (through BNPB – National Disaster Management Agency) as the coordinator for Education Cluster which is part of National Cluster in the early 2014. Through this MoEC's DM Secretariat, Safe School implementations have been strengthening.

Between 2014 – 2015, MoEC's DM Secretariat produced 1) MoEC's Action Plan on Education Sector's disaster management program, 2) MoEC's Education Sector Disaster Management Standard Operating Procedure document – followed with facilitating 7 provinces to develop their own provincial Education Sector Disaster Management SOP document, 3) Indonesia Education Cluster TOR, 4) Comprehensive School Safety modules (consist of three modules: Pillar 1 – Safe Learning Facilities, Pillar 2 – School Disaster Management, and Pillar 3 – Risk Reduction and Resilience Education), and 4) Indonesia Safe School Roadmap.

National Secretariat for Safe School. Following the handed over of National Secretariat for Safe School from BNBP back to MoEC, as mentioned previously, begin from 2016 the National Secretariat for Safe School under the leadership of the Directorate of Special Education and Special Services, Directorate General for Basic and Secondary Education together with education stakeholders has started implementing activities written in the roadmap document. The roadmap document and its action plan for 2015-2019 will become the guidance/ reference for implementing Safe School program with an expectation that planned activities which have not been executed will be addressed by stakeholders who have budget availability to implement it.

BNPB – Safe School and Sister School. As mentioned previously, in the last quarter of 2015 BNPB facilitated the adoption of Safe School/ Madrasah from disasters in 10 schools in 10 districts/ municipalities at North Aceh district, West Pasaman district, Bengkulu, Bandung district, Badung district, South Minahasa district, Bima, Ternate, Ambon, Gorontalo. BNPB facilitated Sister School program in disaster-prone areas in Sleman district. Sister School (program) is a commitment between two schools in disaster risk reduction, preparedness and emergency response at school, as well as a development/ modification of school disaster preparedness activities and Safe School/ Madrasah from Disasters. Implementation of Sister School program aims to provide a convenient and feasible teaching and learning environment for students whose schools have been affected by disaster, so that the teaching and learning process can continue to run effectively at support schools that are not affected by a disaster. Ten pairs of school at Sleman district, consisted of ten disaster-affected schools and ten support schools signed MoUs for this purpose.

Ministry of Religion Affairs. The Ministry of Religion that was in charge for Islamic schools/ Madrasah managing more than 7,200 schools has been very active in Safe School activities starting from 2012, participated in the formulation of material for the Perka BNPB No. 4, 2012 on Safe School/ Madrasah that was issued by BNPB and launched by Minister of Education and Culture on the National Education celebration Day, May 2012. In 2013, the Ministry of Religion issued its own Technical Guideline for new classroom construction to apply safe school principles. Recently Ministry of Religion representative also joined FGD of Safe School Mapping and would like to be included as well in the mapping. The data for the map is being prepared and it is expected that the first draft map will be ready in mid of 2016.

Ministry of Home Affairs. The Directorate of Disaster and Fire Management under Directorate General Regional Administration, Ministry of Home Affairs is in charge for facilitation and supervision, coordination of facilitation, monitoring, evaluation and reporting of disaster risk reduction, disaster infrastructure and information, disaster emergency and post disaster, this is to include fire management, and increase capacity of resources for fire management. This tasks specifically to prepare guidance and socialization for emergency post, providing training for leadership how to lead the team for disaster emergency and management, preparing guideline for deconcentration fund for disaster emergency. According to National Plan for Disaster Management (Renas PB) 2015-2019, the task and function of Ministry of Home Affairs is to control regional development programs and activities related to disaster mitigation.

On Safe School work, Ministry of Home affairs actively being members of cross-ministerial team to support the Safe School Pilot in 3 provinces in 2012, facilitating the communicating with the Head of Local Governments. Based on this experience, the ministry supposed to integrate the required of safe school work in the technical guidelines for provincial/ district planning, so that this safe school investment become priority for local government to present not only loosing life of students but also safe the school building investment. Currently the Ministry has included disaster risk reduction in regional development guideline to be prioritized especially in the high-risk disaster areas, not specifically for Safe School. Hopefully in the coming technical guidelines prioritization for safe school will be appeared.

BPPT. BPPT (Badan Penelitian dan Penerapan Teknologi or National Agency for Research and Application of Technology) was also active in participating safe school pilot in 2012, they are interested in researching for disaster resistance school building. The experience of pilot school would be input for further research in retrofitting of damaged school building into disaster resistance school building – Safe School for structural issues.

4.7. School Stakeholders Collaboration

Reducing the risks of natural hazards and preparing for disasters requires collective action. Disaster risk management stretches across many horizontal sectors, such as social, financial, economic, water, energy, and infrastructure, and the vertical private and public sectors. This necessitates coordination among the actors, such as ministries and economic entities.

Moreover, many stakeholders are involved. From the local and municipal levels to the regional and global levels, actors such as non-governmental and community organizations, those from the public and private sectors, and international organizations need to work together. A strong institutional basis for coordinating and implementing effective disaster risk management is crucial.

In effort to build coordination among the government institution towards formulation of an orchestrated implementation has its own challenge. The overlapped programs and fragmented development system have led to different objectives and implementations of the safe school program.

In dealing with this issue, the effort conducted by the World Bank-GFDRR is to push the importance of the coordination among the sectors involved. The World Bank-GFDRR works together with the line ministries with mandate in education and disaster and various stakeholders through technical assistance. The current National Secretariat for Safe School should play more role in coordination of all players in Safe School. All of them have programs related to safe school but still lack of coordination. The programs implemented by the respective line ministries and agency has not been on the same direction in terms of objective of education development in Indonesia.

In the government side, the stakeholders include Ministry of Education and Culture (MoEC), National Agency for Disaster Management (BNPB), Ministry of Religion Affairs (MoRA), Ministry of Public Works (MoPW). Ministry of Home Affairs (MoHA), Safe School National Secretariat under Ministry of Education and Culture.

Partners from foreign government, International NGO and National NGO are also in supporting the government of Indonesia in pushing the agenda of safe school initiative. Programs are formulated towards the translation of safe school initiative. The programs are implemented nationally and locally. Among the partners include Government of Australia (DFAT), KPB or Consortium for Disaster Education, Plan International, Save The Children, UNICEF, and UNESCO.

6. Integration into Government Policies

The Safe School program ideally should be included in the midterm planning documents RPJMN, Renstra of Ministry of Education and Culture and the annual planning document RKP, APBN of the Ministry of Education and Culture.

From the experiences of the pilot project and the exercises during the last few years, safe school principals and mechanism have been adopted in different form of policies, technical guidelines, circular letter, regulation, training module etc. This covered non-structural and structural issues, those are among others:

- Introduction of Safe School in the Circular Letter of the Minister of National Education address to Heads of Region to request for mainstreaming DRR into Curricula (2010)
- Integrated safe school principles and

mechanism into the technical guideline for Specific Allocation Grant – DAK 2012 formulation by BNPB supported by stakeholders including GFDRR/World Bank.

- Integrated the safe school and major content of the technical guideline above into the Regulation of Head BNPB for Guideline of Safe Schools/ Hospitals, Perka BNPB 4/2012.

- Integration of retrofitting for safer school into the technical guideline of Revitalization Program in 35 pilot Junior High Schools (SMP) by Directorate for SMP, Ministry of Education and Culture (2016).

- Integration of Safe School principles into a training module for BOS – School Operation Fund Assistance. Module 2: Healthy, Safe, Friendly and Pleasantly School explains about definition of Safe School, which has two meaning; (1) safe from disasters; (2) safe from bullying, criminal, smoke of cigarettes, pornography. The Module also introduced different type of disasters, and how is the evacuation procedures during earthquake, tsunami, flooding (2015)

- Introduction facilitators for new school construction by Directorate SMP to facilitate the implementation of the guidelines. The effectiveness of the safe school trained technical and social facilitators for the 180 pilot school to facilitate the School Building Rehabilitation/construction team under DAK program was the very successful implementation. The existing consultants recruited by local government for DAK program has no functions as facilitator, instead provision of construction design and not much sharing the knowledge and facilitation processes.

Directorate of SMP-Junior High School is implementing School Revitalization Program in 35 Schools for 2016, this includes introduction of retrofitting mechanism to rehabilitate damaged schools/classrooms. This Directorate SMP issued a Training Module for BOS-School Operation Fund 2015, which includes Safe School non-structural issues (Module 2: Healthy, Safe, Friendly and Pleasantly School).

- Directorate PKLK, Sub Directorate for Infrastructure and Directorate for Early Childhood Facilitation have been

in charge for emergency response so far, providing support during disaster, school equipment (books), arranging place for temporary study, providing uniform and conduct counseling for post disasters. Those have guideline for its SOP.

- The Roadmap for Safe School Implementation prepared by Safe School stakeholder under the leadership of Ministry of Education and Culture and financed by UNICEF. The roadmap has four goals, each has strategic objectives and policy direction. The goals are: i) to protect learners, teachers, and education personnel from death and injury in schools, ii) to improve the quality of educational facilities and infrastructure to make them safe from disasters, iii) Educational continuity in emergencies (during response phase up to recovery phase), iv) Strengthening the school community's resilience in the face of disasters through education

Scale – up and Way Forward

There are some good practices from the safe school pilot implementation and other relevant Safe School programs. Some good practices would need to be scale up to gain wider impacts, among others:

- The important role of facilitators to transfer the knowledge of safe school principles and practices for Central and Provincial and District construction, rehabilitation, and reconstruction school building program. The New School construction program introduced facilitators to facilitate the self-managed school construction or through 3rd party. The successful of the pilot Safe School had also influenced by the role of technical and social facilitators to guide the implementation of structural and non-structural Safe School principles. The DAK has consultants (management and technique) to support the school rehabilitation program that are provided by Local Government. The role of consultant should be added to facilitate and transfer the knowledge of safe school.
- Training of Safe School principles and practice for facilitators/consultants who will involve in the construction, rehabilitation and reconstruction school building program
- Include the Safe School program into the Mid Term and annual plan in the different level national, province, district and event in school level and guideline for local government in preparing APBD.
- Integrated monitoring and evaluation by MoEC, BNPB, Cipta Karya (KemenPUpera) in selected targeted schools and routine monitoring and evaluation by Dinas Education and Sport, BPBD, Cipta Karya at district level using the same monitoring and evaluation instrument. Formalize the monitoring and evaluation instrument into the guideline.
- Stakeholder coordination as managed by National Secretariat of Safe School at central level should also be replicated at regional level.to better coordinate the stakeholders.
- The typology survey on school construction in Indonesia has resulted several type of school construction, which will need different treatment. This classification could be used to allocate fund for school rehabilitation. The survey will need to be scale up to national level.

Chapter 05

Safe School Results and Way Forwards

Sendai Framework

The Government of Indonesia reported the implementation of disaster risk reduction in Indonesia in the Third World Conference on Disaster Risk Reduction (UNWCDRR) held from 14 to 18 March 2015 in Sendai City, Miyagi prefecture, Japan and also reported the achievement of Safe School which was considered quite progressive.

Indonesia has met its first commitment towards the implementation of the Worldwide Initiative on Safe Schools, particularly through the development of national plans for safe schools. The country has also been engaged in advocacy with other countries and other leaders in the promotion of safe schools at the global level through participation in safe schools-related events at the regional and global levels. In addition to passing the Safe School Roadmap, the country will also adopt a set of national targets based on our national priorities as set out in the new Middle-term Development Plan 2015-2019.

The conference has resulted 7 targets, safe school initiatives could contribute to those targets, and nevertheless the most relevant are targets number one, two and four. If a big number of schools communities with students more than 40 million know how to evacuate when disaster happened and applied the safe school principles, this can contribute significantly to the target number one and two to reduce global disaster mortality and reduce figure by 2030, aiming to lower the average per 100,000 global mortality rate and lower the average global figure in the decade 2020–2030 compared to the period 2005-2015. A large amount of school facilities with more than 250 thousand schools will substantially reduce disaster damage to critical infrastructure and disruption of basic services, especially educational facilities, including through developing their resilience by 2030 as stated in the target number four.

Among the key targets for inclusion in HFA2 (Sendai Framework), the Education sector stated that no child dies due to disaster in a school built or modified after 2015; and number of school days missed as results of shocks or stresses is reduced by 50%.

In contribution towards the realization of these targets above, the stakeholder's group is committed towards creating a space at the regional level for discussion and sharing of technical resources, good practices/ lessons learned and model policies on safe schools to minimize the impacts of disasters to children's education; and coordinating and promoting the adoption, development and implementation of the Comprehensive School Safety Framework (CSSF). Specifically, those groups has been focusing on the work of Safe Schools that guided by the Comprehensive School Safety Framework (CSSF); and children are supported to participate meaningfully in local level DRR and development planning processes.

Results

The results have been achieved to date covers policies, programs, pilot projects, training and its modules, capacity building.

On the policies. The policies have been issued are ranging from a circular letter, regulations, guideline, for example a circular letter of the Ministry of National Education on mainstreaming the DRR in education sector through curriculum (No. 70a Year 2010); the monumental Regulation of National Agency for Disaster Management (BNPB on Safe Schools/ Madrasah (No 12 year 2012); and technical guidelines for Specific Allocation Fund – DAK (2011, for DAK implementation in 2012), guideline for healthy, safe, friendly and pleasantly school (2015); guideline for revitalized schools (2015).

On the program. In line with the guidelines above, the program and budget were allocated through Specific Allocation Fund for School Rehabilitation and Social Assistance Fund from the Ministry of Education and Culture to address identified damaged schools, Revitalization program for 35 Junior High School (2016) include the application of 'retrofitting'; Pilot safe schools for structural and non structural issues to implement the Regulation of BNPB No. 4/2012 on Safe Schools/ Madrasah; integration of safe school for non structural issues in BOS – School Operational Assistant Fund program; The Roadmap on Safe School (2015-2020) has reflected how the Safe School will be implemented in Indonesia.

For socialization, training and the training modules. There have been many socialization and trainings on Safe School conducted by different parties (Ministries of Education and Culture, BNPB, Ministry of Religion, international development partners, NGOs) for different target groups ranging from teachers, school principles, school committee, provincial and district education staff, central level staff (BNPB, Ministry of Education and Ministry of Religion) from 2010-2016. Unfortunately no collective data can be obtained for all those participation in the socialization and trainings. Wider participants were socialized during the annual working meeting conducted by the Ministry of Education which were participated by head of provinces and district education office from all over Indonesia, as well as during the training for BOS (Bantuan Operational Sekolah- School Operational Assistant Fund), similar by the Ministry of Religion. Specific training was conducted for regional facilitators by BNPB covering participant for 31 provinces (2015).

Some of those training conducted within the pilot projects; some were post pilot projects as the impact of the pilot for more dissemination, e.g. the 180 pilot Safe School projects supported by GFDRR/ BEC-Trust Fund, World Bank to support the BNPB and the Ministry of Education and Culture. The pilot project of 2012, in 2013 the provincial education office requested to socialization and training for the non-pilot participated district in West Nusa Tenggara. In 2016 several school principals still requested for books related for safe schools that he/she learnt from the pilot project, either for different schools and/or for a new school where he/she assigned. The thought of the school principals to implement safe school in the new school is very important message for sustainability post pilot project.

There have been produced several books, modules for further use in the training as guideline. The Ministry of Education and Culture, led by the Bureau of Planning and Foreign Cooperation, National Secretariat for Safe School produced three modules to explain more details the comprehensive safe school supported by Safe School stakeholders team financed by UNICEF in 2015, i.e. Module 1 on Safe Learning Facilities; Module 2 on School Disaster Management; Module 3 on Risk Reduction and Resilience Education. The World Bank Team also produced Practical Guideline for Safer School that was formulated based on experiences from the 180 pilot schools project (2015 revised in 2016). This practical guideline could be used as extension of the Module 1 on Safe Learning Facilities for the training.

Others. Arup Consultant financed by GFDRR/World Bank has produced the report of Survey for typology of school construction in Indonesia. This result could be replicated at national level, and this could be used to improve the pattern of financing school construction based on their typology for the whole countries. The GFDRR/World Bank team to support the BNPB and Ministry of Education and Culture in prioritizing their program in the disaster prone areas has also produced a Risk School Map and its report.

Institutional set up. National Secretariat of Safe School has been very effective in coordinating the stakeholders on Safe School. Internal program coordination should be improved to integrate safe school implementation in the existing program by working units.

Participation in International Events. The participation of Indonesian Government representative in the international event related to Safe School has gained recognition by International community on the safe school implementation in Indonesia, which is considered a head than other developing countries.

Way forwards

The Sendai Framework produced in the World Conference for Disaster Risk Reduction (2015) defined seven global

targets that have been agreed to support the assessment of global progress in achieving the framework outcome and goal (2015). This will be measured at the global level and will be complemented by work to develop appropriate indicators, the National targets and indicators.

Indonesia is committed in advancing the Worldwide Initiative for Safe Schools and committed to translate the Sendai Framework into concrete target, roadmap, procedural and the program framework built upon the existing Government school construction and rehabilitation program and schemes. The commitment of Government Indonesia reflected in the provision of significant amount of budget for the improvement quality of school facilities. e.g. the tranferred budget to local government for 2016 (DAK) directed for improving infrastructure of primary education and special need primary education. 40% of the budget will be allocated for physical infrastructure for heavily damaged classroom rehabilitation and new school construction.

Policy and program. Implement the Roadmap 2015-2020 and integrate the activities with the existing program; Integrate the Safe School principles into the technical guideline of each program related to construction, rehabilitation and reconstruction e.g. DAK for school rehabilitation and construction of new schools 2016; Ideally safe school shall be integrated in the mid term plan and annual planning both in central, local level, and school level. A pocket guideline for safe school procedures and technique for school level is required to make easier the safe school implemention.

Preparation of School Vulnerability Assessment. Diagnostic to update school vulnerability assessment as the basis for typology of construction and options for structural strengthening and school safety; Develop school risk mapping in disaster prone areas to rank program priorities; Develop tools to prepare baseline data and its verification for improving national education database (Dapodik); Review relevant issues on construction, rehabilitation and reconstruction of disaster resilient school facilities and infrastructure to be integrated in the existing regulation

Assessment and Recognition system and instrument; Develop assessment and recognition system and tools to ensure compliance with the safe school facilities and infrastructure standards. Implement assessment and recognition system for school facilities and infrastructure compliance with the safe school/ madrasah standards; This will need (1) Instrument Checklist for assessment of school facilities and infrastructure and its standard guideline (picture, photos); Visual Observation Sketch in assessment of school physical condition (sampling); (3) instrument for recognition (certification) for the implementation of school facilities and infrastructure compliance with the safe school building standards refer to structural, non-structural, functional and area situation and its hazards; (4) Certificate for Safe School facilities and infrastructure; (5) Number of certified schools are safe school from disaster.

Capacity Building, Socialization and Training. Once the safe school principles integrated into the existing government program and its guideline (procedure and technical), the annual working meeting usually will be conducted to socialize the program and the training for mastering the technical guideline will be conducted, this will include the integrated safe school principles in the guideline. The technical training should include district education, school principal/teacher responsible for the school construction/rehabilitation, reconstruction. Beside socialization and training, facilitation by technical and management facilitators or consultants (who should have facilitation function) for school and district level l, to improve capacity of actors, institutions involved in the construction, rehabilitation, reconstruction school and district education office. At School level, the school community shall be trained and practice evacuation drill regularly following the evacuation path and signed established purposely.

Monitoring and Evaluation. Monitoring and evaluation of school facilities and infrastructure; Develop instrument, method, system and mechanism for monitoring and evaluation of school facilities and infrastructure and integrated with the existing system and instrument, this should be able to be accessed by public and updated; In district level joint monitoring and evaluation shall involved district education office, district disaster management office and district Cipta Karya or Public Works office.

Knowledge Management and Sharing. Gather the experiences of safe school implementation and structure the information and knowledge and preparing for knowledge sharing, updated and ready to be used in the international comparison and lesson learnt for other countries.

Key Messages of Succesful Implementation

The successful implementation of Safe School will depend on the budget provision for the national program on School construction, rehabilitation and reconstruction and integrate the safe school principles into the program procedure and technical guidelines. The source of budget could come from central level APBN, earmarked transfer from central to local govern (specific allocation fund), Local Government budget (APBD) and could also from private donation or CSR fund.

Other important aspect is capacity building during the Safe school implementation through facilitation and supervision, training, socialization and ensuring the regular practice especially for equation drill.

The roadmap for Safe School Implementation formulated as a joint collaboration among the Safe School stakeholders led by Ministry of Education and Culture, as management of National Secretariat for Safe School, and financed by UNICEF. The collaboration processes in the formulation will strenghten the realization for implementation, as some program contributed by the implementation of the parties involved on the Roadmap formulation. The challenges for full implementation of the roadmap still remain, the National Secretariat for Safe School stilll need to ensuring the implementation by working unit in the Ministry and local level.

Annex: 1. Chronology of Safe School Initiatives

1. July 2010 – Indonesia joined "One Million Safe Schools and Hospitals Campaign" and launched the national campaign on safe schools and hospitals. During this event, the Vice Minister for Education and Culture pledged to ensure that thousands of schools would comply with school safety standards, and that the Education Office at provincial and district/ municipality level were urged to participate in the campaign and its school safety standards implementation.

2. July 2010 – Indonesia joined "One Million Safe Schools and Hospitals Campaign" and launched the national campaign on safe schools and hospitals. During this event, the Vice Minister for Education and Culture pledged to ensure that thousands of schools would comply with school safety standards, and that the Education Office at provincial and district/ municipality level were urged to participate in the campaign and its school safety standards implementation.

3. December 2010 – National Conference on Safe Schools, organized by Plan Indonesia in close collaboration with the Ministry of Education and Culture, BNPB, Plan International.

4. 2010-2011 – Ministry of Education and Culture conducted GIS based school mapping and monitoring through integration of safe school data with the Education Management and Information System (EMIS) to collect data on schools which were categorized into heavily damaged/ totally destroyed schools, medium damaged schools (damaged, but can be repaired), and slightly damaged schools (can easily be repaired).

5. 2011 – BNPB developed disaster risk map, supported by World Bank based on Ministry of Education and Culture request, to identify schools that were located in disaster prone areas and these schools would be prioritized to be rehabilitated and/ or reconstructed. The assessment indicated that 75 percent of school buildings in Indonesia are located in disaster prone areas.

6. 18 February 2011 – BNPB supported by Ministry of Education and Culture, Ministry of Public Works (Cipta Karya), BPPT – State Ministry of Research and Technology, BAPPENAS, Planas (National Platform), Kerlip, Plan Indonesia, UNESCO Jakarta Office, and PPMB ITB issued "Guidelines for Safe School Rehabilitation using Education Special Allocation Fund (DAK) 2011".

7. 25 August 2011 – Establishment of National Secretariat for Safe School. This National Secretariat reported directly to the Vice Minister for Education and Culture and was managed by Kerlip (local NGO), funded by World Bank.

   However, on 2013, the National Secretariat for Safe School was handed over to BNPB and between 2013-2014 BNPB tried to develop Blue Print for National Secretariat for Safe School.

8. September 2011 – Based on the mapping result, Ministry of Education and Culture launched National Program on School Rehabilitation (for elementary/ SD and junior high school/ SMP) and this activity was targeted to

be completed by 2012. For this activity, MoEC allocated IDR 17.4 billion using Specific Allocation Fund (DAK) and State Budget (APBN) managed by MoEC. The Ministry of Religious Affairs (MoRA) also implemented the same activity for madrasah, and MoRA allocated IDR 3 billion for this purpose. This School Rehabilitation activity was a mandate stated at President Instruction No. 1/ 2010 on accelerated development to improve the quality of service and education management which was coordinated by the Vice President through President's Delivery Unit for Development Monitoring and Oversight (UKP4).

Since this School Rehabilitation Program launching, the Government of Indonesia has provided Specific Allocation Fund for more than IDR 7.6 billion annually , specifically allocated for safe school rehabilitation and construction on top of national government budget. The Specific Allocation Fund was transferred directly to the local government.

9. 2 May 2012 – A Guideline for Safe Schools and Madrasah was issued by BNPB (Perka 4/2012) and launched together with Ministry of Education and Culture during National Education Day commemoration on 2 May 2012.

10. May 2012 – Piloting of more than 200 Safe Schools led by MoEC and BNPB (2012-2013), supported by World Bank (GFDRR and BEC-TF), Plan Indonesia and others in 6 provinces: West Sumatera province, East Kalimantan province, DKI province, West Java province, Central Java province, NTB province, and NTT province. Pilot project were conducted to schools which previously received Specific Allocation Budget for Education in 2012. In addition, Ministry of Religious Affairs also implemented Safe Schools/ Madrasah in 17 provinces .

11. October 2012 – Three events on Safe Schools at the 5th Asian Ministerial Conference for Disaster Risk Reduction (AMCDRR) in Yogyakarta were conducted 3 sessions related to Safe Schools, two among of those hosted by the Ministry of Education and Culture supported by GFDRR-World Bank and one hosted by Plan International as explained above.

12. 2012-2013 – Australia Education Partnership with Indonesia (AEPI) assisted Ministry of Education and Culture on the development of community based construction model and built 764 new safe schools in 28 provinces.

13. 2013 – BNPB issued Safe School Directories until 2013 in relation with the issuance of Guideline for Safe Schools and Madrasah.

14. October 2013 – two events related to Safe Schools were conducted during DRR month commemoration at NTB province: 1) Showcase of Safe School Implementation at SDN 1 Telagawaru, Lombok District which was funded by GFDRR/ World Bank; 2) Safe School Seminar, organized by Save the Children.

15. 2013-2014 – BNPB organized several workshops to develop and later to finalize the National Secretariat for Safe School Blue Print. However, until October 2014 the Blue Print was never finalized.

16. June 2014 – Ministry of Education and Culture formed MoEC's Secretariat for Disaster Management (MoEC's DM Secretariat) – under the Bureau of Planning and International Cooperation,

Secretariat General's responsibility – in order 1) to improve education sector's disaster management programs (preparedness, response and recovery) for 2014-2015; 2) to develop policies, strategies, and 2015-2019 action plans related to education sector's disaster management program; and 3) to improve coordination on education sector's disaster management programs both with the MoEC's main units and with external parties ((other Ministries/ Agencies, NGOs, UN Agencies). Through this MoEC's DM Secretariat, Safe School implementations have been strengthening.

17. 22-26 June 2014 – Ministry of Education and Culture joined the 6th Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR) in Bangkok. During this event, MoEC presented Lesson Learned on Indonesia Safe School implementation on Pillar 1- Safe School Facility.
18. October 2014 – During the DRR month commemoration at Bengkulu province, BNPB handed over the National Secretariat for Safe School back to the Ministry of Education and Culture.
19. 30-31 October 2014 – Ministry of Education and Culture joined First Meeting of Safe School Country Leaders (Istanbul, Turkey), in which MoEC presented the achievement of safe school implementation in Indonesia.
20. 4-7 November 2014 – Ministry of Education and Culture joined Regional Consultation Meeting on Education and Resilience in East Asia and the Pacific: Programmes and Policies that Promote Social Cohesion and Comprehensive School Safety in Quezon City, Philippines, in which MoEC presented the Indonesia good practice policies for resilience to natural disasters and climate change.
21. January – June 2015 – Developing standard modules for Comprehensive Safe Schools (CSS) which reflecting the 3 pillars of CSS: 1) Safe Learning Facilities, 2) School Disaster Management, and 3) Risk Reduction and Resilience Education. There were several stages taken on developing these CSS standard modules:
    - Desk study review on available policies and other tools related to Safe School. This desk study was planned by the MoEC to review policies and other tools available related to Safe School/ Madrasah, whether they were issued by MoEC, MoRA, BNPB, NGOs or UN Agencies. Expected outcome from this desk study review was to have a catalogue on policies and tools for the three pillars of Comprehensive School Safety (CSS).
    - Development of CSS standard modules, which was based on the desk study review result. Existing policies and tools were compiled according to the three pillars of CSS, which will benefit MoEC's plan to equip CSS facilitators for teachers training with knowledge of available resources. MoEC plans to print the standard modules and distribute them to the CSS facilitators.
    - Exposures of CSS standard modules to MoEC's main units and also to education sector stakeholders.
22. 23-24 February 2015 – Ministry of Education and Culture joined technical meeting on the Istanbul Roadmap for the Worldwide Initiative for Safe

Schools (WISS) in Geneva, in which MoEC presented the Comprehensive Safe School implementation in Indonesia.

23. 14-18 March 2015 – Ministry of Education and Culture joined the 3rd UN World Conference on Disaster Risk Reduction (WCDRR) in Sendai, Japan. During this conference, the Government of Indonesia gave their commitments 1) to the implementation of the Worldwide Initiative on Safe Schools, particularly through the development of national plans for safe schools; and 2) to pursue allocation of 20% of its annual development budget to education (and school safety).

24. 19-20 March 2015 – Ministry of Education and Culture attended the Technical Workshop on Safer School Facilities in Tokyo, Japan. This event was organized by GFDRR – World Bank and this was part of Global Program for Safe School (GPSS) of GFDRR. This activity was attended by countries, which would be part of GPSS, including Indonesia who was represented by MoEC.

25. 19-22 May 2015: Ministry of Education and Culture attended World Education Forum 2015 in Incheon, South Korea, in which MoEC presented the progress of Safe School in Indonesia program.

26. May- September 2015: Development of Safe School Roadmap. On May 2015 MoEC decided to develop Indonesia Safe School Roadmap, instead of finalizing the National Secretariat for Safe School Blueprint (the initial draft was developed by BNPB). The Roadmap document also addresses Safe School institutionalization (National Secretary for Safe School). The document was finalized on December 2015, and the plan was to have a formal handover from the Bureau of Planning and International Cooperation, Secretariat General to the Directorate of Special Education and Special Services, Directorate General for Basic and Secondary Education. However until now discussion on National Secretariat for Safe School structure including its coordination mechanism is still going on.

27. 29-30 September 2015: 2015 National Conference on Safe School in Jakarta on "Obtaining Commitment on Safe School in Relation with Sendai Framework for Disaster Risk Reduction" which resulted a declaration. Participants coming from MoEC, BNPB, Ministry of Religious Affairs (MoRA), Ministry of Women's Empowerment and Child Protection (MWECP), Ministry of Home Affairs (MoFA), Ministry of Public Works and Public Housing (MPWPPH), Regional Parliament (DPRD), Provincial government, District/ Municipality government, religious society organization, Consortium for Disaster Education (CDE or KPB), learners, teachers and other education personnel, private sectors, mass media, universities, and National Headquarter of Scout Movement.

28. 16-18 October 2015: National Commemoration for DRR Month in Solo – there were three working session during this commemoration event, and there was one working session (Working Session #2) on Safe School/ Madrasah. During this session, it was mentioned that identified challenges on implementing Safe School program are: 1) Geographical conditions (of Indonesia) have caused many disasters; 2) On realization of the Government of Indonesia's commitment as Safe School Leader that has been conveyed at 2015 UNWCDRR; 3) On maximizing

the absorption of the allocated education budget (20% of the total annual national development budget) to improve school facilities and infrastructure damaged, while safe school standards are not yet available, therefore there is a need to develop the Indonesian National Standard on Safe School in order to be used by all actors as a reference.

On the other hand, there are still some challenges on integrating disaster risk reduction into education system, such as: 1) Curriculum burden for the students; 2) Lack of teachers' understanding on disaster issues; 3) Lack of teacher's capacity and capabilities on integrating DRR into curriculum; 4) Lack of distributed reference, syllabus and teaching material which can be accessed by the teachers; 5) Lack of resources (human resources, budget and facilities); 6) Physical condition of school buildings, facilities and infrastructure needs improvement, as they were built without considering the environmental impact analysis and safe construction; and also 7) Institutions and local regulation on disaster management at district/ municipality level are not available. Follow up recommendations are:

1. Dissemination of a new paradigm on disaster management in general and specifically on the concept and practice of safe school / madrasah;
2. Commitment in programming, budgeting, implementation, and a structured, scalable and efficient monitoring and evaluation system;
3. Develop strategies on resource optimizing in order to integrate disaster risk reduction into education system;
4. Finalize the development of national Safe School Roadmap 2015-2019;
5. Develop Indonesian National Standard on Safe School with its clear and applicable indicators, including disaster symbols;
6. Improve data center and develop information system by integrating safe school data;
7. Integrate disaster risk education in education which met the Indonesian National Standards indicators, and Safe School certification and accreditation;
8. On involving scouts as disaster risk reduction education agents who actively conduct independent assessment on schools located at disaster prone areas.

29. October- December 2015: BNPB facilitated the adoption of Safe School/ Madrasah from disasters in 10 schools in 10 districts/ municipalities at North Aceh district, West Pasaman district, Bengkulu, Bandung district, Badung district, South Minahasa district, Bima, Ternate, Ambon, Gorontalo. Goals of this activity are:

    1. Build a culture of preparedness, a culture of safety, and a culture of disaster risk reduction in schools, along with building a planned, integrated, and coordinated school community resilience on disaster by utilizing the available resources in order to protect students, teachers and school community from disaster risks and its impact

    2. Disseminate and develop disaster knowledge to the wider community through the education system

    3. Develop Safe School/ Madrasah from Disasters program

30. October- November 2015: BNPB facilitated Sister School program

in disaster-prone areas in Sleman district. Sister School (program) is a commitment between two schools in disaster risk reduction, preparedness and emergency response at school, as well as a development/ modification of school disaster preparedness activities and Safe School/ Madrasah from Disasters.

Activities part of Sister School program are: 1) Forming Disaster Preparedness Team; 2) Conduct assessment on hazards, vulnerability, capacity and risks; 3) Develop contingency plan; 4) Socialization and training; 5) Develop evacuation route map and evacuation signs; 6) Develop DRR EIC (education, information and communication) media; 7) Conduct emergency drill/ simulation; 8) Integrate DRR issues into extra-curricular activities; and 9) Develop MoU between impacted school and support school.

Implementation of Sister School program aims to provide a convenient and feasible teaching and learning environment for students whose schools have been affected by disaster, so that the teaching and learning process can continue to run effectively at support schools that are not affected by a disaster. Ten pairs of school at Sleman district, consisted of ten disaster-affected schools and ten support schools signed MoUs for this purpose.

31. November 2015: Adaptation on the VISUS (Visual Inventory for Surveying and Upgrading Safety) methodology, which was piloted at 60 schools in Indonesia, was a cooperation between MoEC, UNESCO and ITB, is to be used as Pillar 1 instrument for conducting assessment on school's structures and safe school's facilities and infrastructures.

TECHNICAL NOTE 5

URBAN RESILIENCE IN INDONESIA

Concept and Practices

WORLD BANK GROUP

i3URI

GFDRR
Global Facility for Disaster Reduction and Recovery

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URBAN RESILIENCE IN INDONESIA

Concept and Practices

FOREWORD

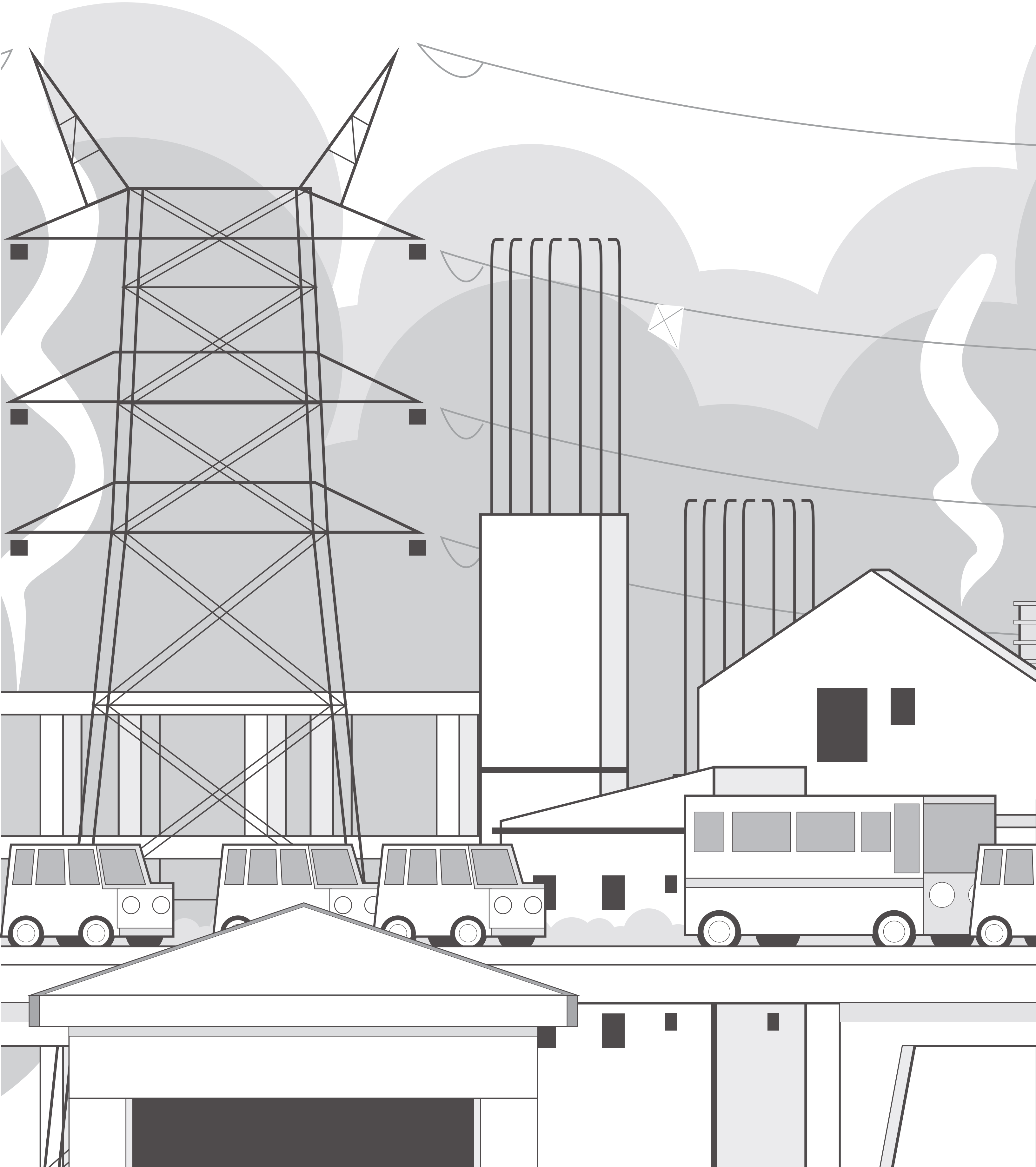
Indonesia is a disaster-prone country, especially to disasters linked to climate change. Cities in Indonesia are particularly vulnerable due to the complexity of the system, population density, utilities and infrastructure system. Consequently, there has been an attempt by the Government of Indonesia (GoI) to reduce disaster risk and to mainstream it into the national development planning.

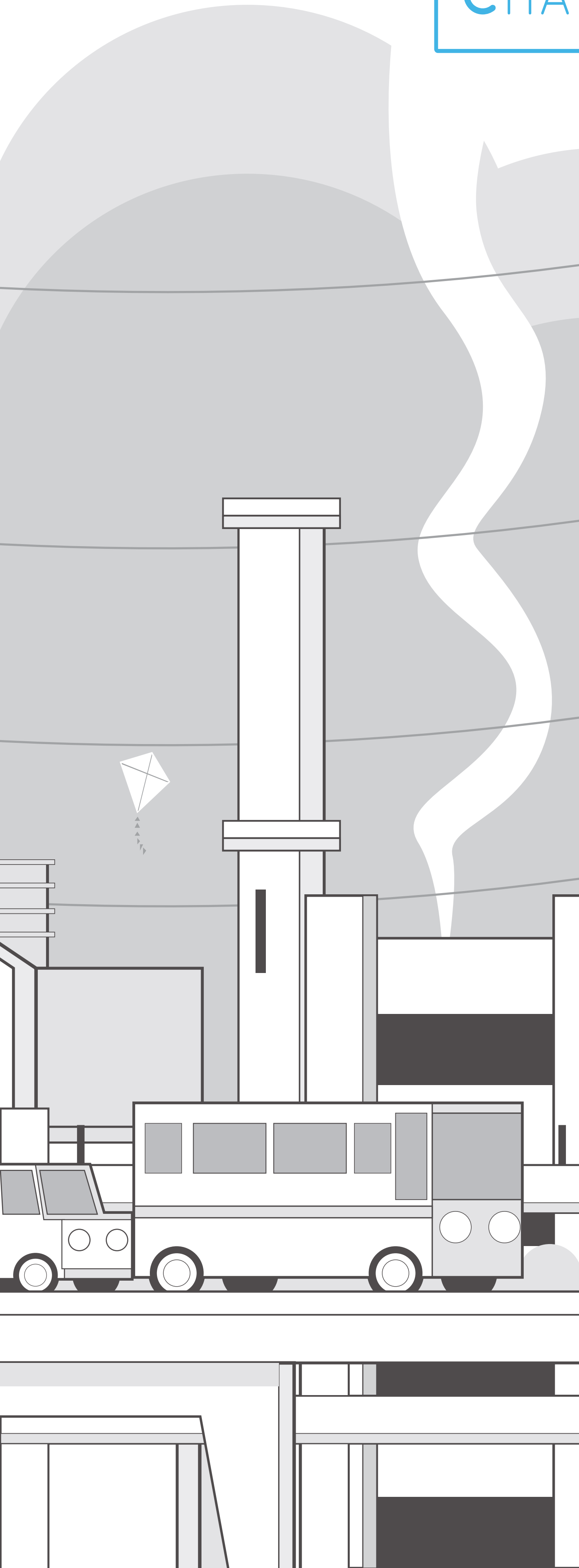
This publication is developed for urban spatial planners, policy makers and practitioners of urban disaster management in order to provide a basic understanding of the concepts and systematic steps that should be done to build a resilient city. Examples of relevant practices are provided on how the implementation of resilient cities takes place in Indonesia.

The proposed concepts and actions are summarized from various sources of literature and experiences in Indonesia. This publication is not meant as a standard or a guideline for urban resilience planning, but it will give initial understanding to combine the concept of urban resilience into urban planning. On the other hand, the technical procedure of the implementation will require further exploration.

In the first part, this work will discuss about the urbanization trend and its impact to urban vulnerability. It is followed with basic concept of urban resilience, the policy framework of urban resilience in Indonesia and indicative measures needed to strengthen the resilience of the city. It follows up with key phases to making cities resilient. The final section provides examples of related urban resilient practices.

ACKNOWLEDGEMENT





CHAPTER 1

FOCUS ON CITIES

1.1 Rapid Urbanization

Urbanization gains its momentum as early as the industrial revolution by the end of the eighteenth century, where real "urbanized societies" were developed. With technological invention that replaced hand tools with power-driven machines, agricultural societies gradually evolved into industrial societies, and a high proportion of the population began to inhabit the cities. The concentration of industry in large led to socio-economic transformation, where societies started to develop and segregated with specializations and skills. Along with this, institution of governments was formed to manage people and societies. This period was also defined by mass production, the rise of nation state, and modern medicine that increased dramatically the quality of human life.

Ever since the industrial revolution, several categories of cities, such as small cities and medium sized cities have emerged. Now, the categories expand from small, medium, big, metropolitan and megacities. As cities grow, they offered more and bigger services, infrastructures, and opportunities for their inhabitants. However, along with the population increase, the population density also increases which often accompanied by a variety of risks such as fires, diseases, crimes, social conflicts and declining environment. Rapid urban development in hazard-prone areas also contributed to the creation of risks. This occurred due to partial development that is characterized by unequal access to infrastructures or public services and unavailability of urban space for the poor. Consequently, due to lack of option, poor households inhabit flood-prone river banks, steep slopes or areas with a high level of environmental degradation. In addition to the risk faced, these areas have little access to public infrastructure. Moreover, the vulnerability of poor households could be intensified by lack of access to social protection. This phenomenon is recognized in Global Assessment Report on Disaster Risk Reduction 2015 which stated that "in many low and middle-income countries, urban development is characterized by highly unequal access to urban space, infrastructure, services and security" (UNISDR 2015).

Economic growth, rapid technological advancement, the promise of prosperity and the current drive of globalization have further fostered the process of urbanization. In some countries, this process has given rise to megacities. Megacities have their own advantages and challenges. Mega-urban life offers various advantages such as improved economic opportunities, better quality of life, easier access to basic services, and a rich cultural life. However, with increasing social polarization induced by globalization, the proportion of marginalized population that is excluded from these benefits is growing within megacities. These poor people are particularly vulnerable to the negative effects of economic, social and political insecurity, exploitation, environmental pollution, natural hazards, health crises, and food insecurity.

1.2 Cities, Disaster and Climate Change

Due to limited of space, the city development has put its citizen, infrastructure and assets exposed to disaster prone areas. This is theoretically illustrated through the interaction between natural hazards, exposure and vulnerability that creates disaster risks in the city (Figure 1.1a). This condition can be exacerbated by poverty and environmental degradation, poor plan development plan and external factors, such as climate change (Figure 1.1b).

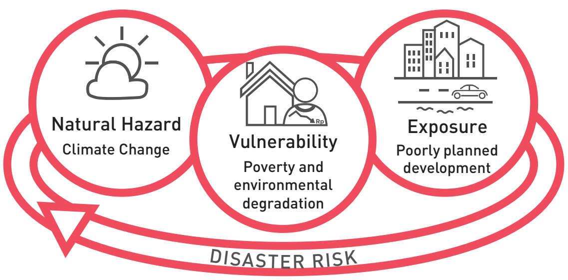


Fig. 1 The interplay of natural hazards, exposure and vulnerability in creating disaster risks

Poverty and environmental degradation is a complex problem that is closely linked with social structure and economic activities of the cities. Growing urban population and increasing density will put pressure on the environment, and hence increasing poverty and vulnerability. Increased settlements in hazard-prone areas and poorly planned development will increase exposure to risks, while through changing temperatures, precipitation and sea levels, climate change has intensified hazard levels. The interplay ofall these drivers may increase the scale of disaster risks.

Poorly planned development may expose the city to greater risks. For instance, without careful planning, reclamation in coastal areas can cause flooding, as it destroys wetlands that form a natural buffer between the ocean and the land. On the other hand, a well-planned and properly constructed reclamation projects may provide additional land areas and added protection for cities as they may serve as sea barriers to mitigate the effects of rising sea levels.

Climate change pose another potential and significant threats to city resilience, such as through sea level rise, water scarcity, coastal flooding, extreme weathers. Coastal cities in South East Asia, such as Jakarta, Bangkok and Manila have been frequently hit by disasters that cost fatalities and economic losses. A report by EEPSEA (2009) stated that five out of six municipalities in Jakarta were very vulnerable to climate change impacts. Without a careful mitigation and disaster risk reduction plan, the losses can be enormous in the future.

A study by the World Bank (Dickson et al. 2012) concludes that compared to rural areas,urban areas suffer greater fatalities and economic losses due to disasters. With more than half of the world's population currentlyliving in cities and an additional two billion people will live in cities in the next twenty years, city residents will face increased risks in the future. Also, with the growing number of urban residents living in slums and the worsening impacts of climate change, without significant changes in the management of disaster risks and urbanization, many cities will continue to sustain heavy losses due to disaster.

Data from the World Bank (2015) show that urban areas are adding at 1.4 million people per week and it is projected that 90% of urban growth through 2050 will occur in Africa and Asia (see figure 2). The data also demonstrate that weather-related losses have increased significantly in 1980-2013, suggesting that climate change is increasing the frequency and intensity of weather-related disasters.
intensity of weather-related disasters.

"Without risk sensitive development, population growth and rapid urbanization will lead to increased exposure and risk"

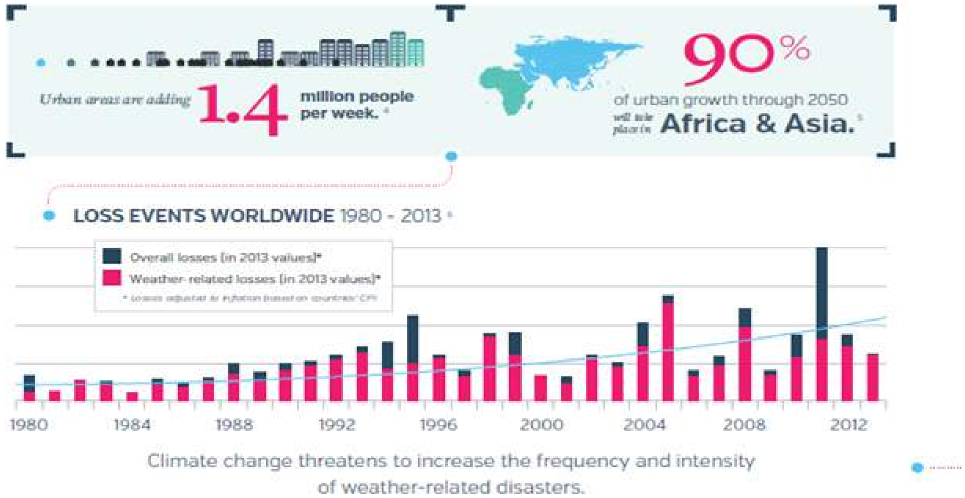


Figure 1.2Population growth, rapid urbanization and climate change risks
Source: Investing in Resilience: Sendai 2015, World Bank.

Figure 1.3 Jakarta Flood 2013

Table 1-1. Urban Climate-related hazards

Table 1-1. Urban Climate-related hazards

Climate-related hazard	Projected impact
Sea-level rise and storm surges	**Sea-level rise**: Erosion and saline intrusion threatens coastal ecosystems: dunes, water tables, river water flows, and wetlands. **Storm surges**: Threaten coastal housing and municipal infrastructure—port and trade logistics facilities, highways, power plants, water treatment plants—due to increased runoff contaminant and change in population distribution.
Extreme rain events	Higher frequency and intensity of flooding, road washouts, and landslides may occur in urban areas, threatening vulnerable settlements. Heightened risk of vector-borne diseases exists.
Heat waves/heat-island effect	Heat wave affects cities more severely than rural areas given the heat-retaining built environment (e.g buildings, paved areas) and lower air wind speeds velocity. Subsequently nighttime cooling will be considerably reduced considerably nighttime cooling, and which may result in higher-than-average morbidity and mortality, particularly in older persons. Possible impacts include increased energy demand for air conditioning, increased road surface damage, increased water demand and consequently water contamination.
Prolonged dry season	Changes in precipitation patterns and the period of dry season will reduce supplies in reservoirs and availability for urban use; thus will create water scarcity and will increase runoff contamination.
Air pollution	Air pollutants from fixed and mobile sources, volatile organic compounds (VOCs) and nitrogen oxides (NOx), react to increasing temperatures with the formation of ozone at ground level (ground ozone), and create surface inversion. These incidents will create smog which affects children and older persons' health in particular.

Source: Adapted from World Bank (2009b) in Dickson et al (2012)

1.3 State of Indonesian Cities

Indonesian cities are thriving rapidly during the past 15 years, with the development of 34 new cities as a result of district or town expansion, which in parthas been driven by the decentralization andregional autonomy policy. Data from the Ministry of Home Affairs suggest that in 1999-2015, 529 new regions have been established, including 34 provinces, 402 districts and 93 cities . Concentration of urban population in Indonesia are mostly found in Java and Sumatra (Figure 1.4).

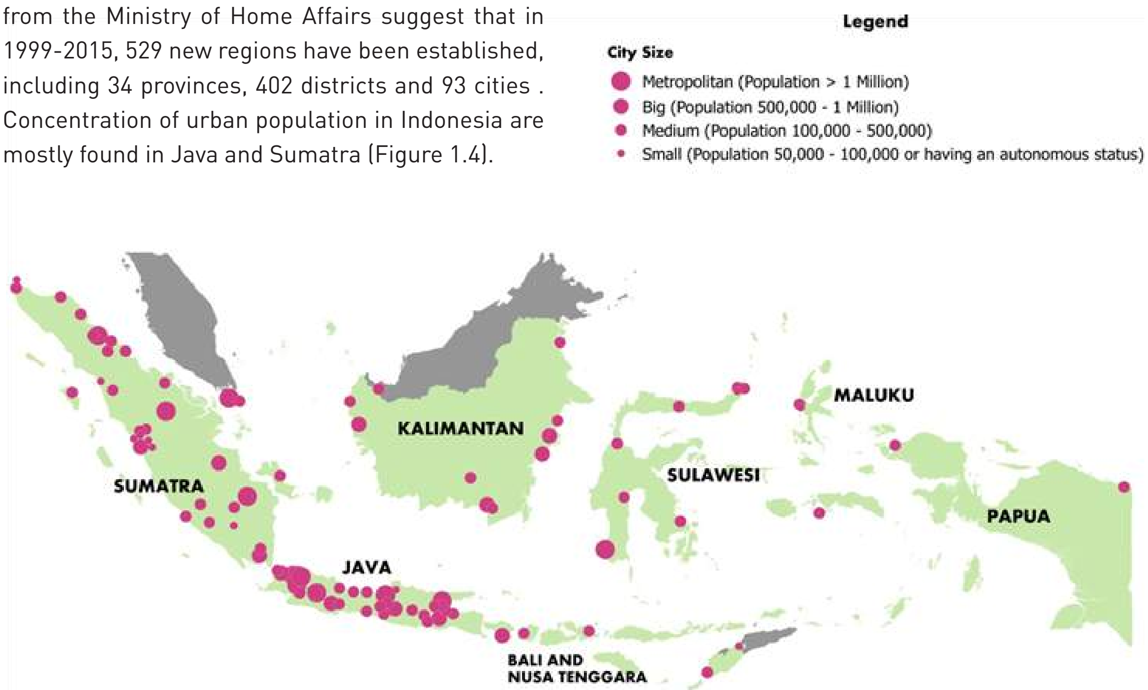


Figure. 1.4 Indonesian Metropolitan Cities

Figure 1.5Rapid urbanization and projection in Indonesia
Source: National Development Planning Board, 2014

In the period of 1980-2010 the urban population of Indonesia had increased six fold from 20.5 million (1980) to 118.7 million (2010). It is projected that the country's urban population will reach 203.5 million by 2035. Urban population will increase by 3.4 million people per year or approximately 800,000 new households in the period of 2010-2035. This will have huge implications on the demand for urban housing and settlements, basic services, transportation and urban utilities.

The trend shows that Indonesian citizens will concentrate more in metropolitan areas and megacities. BPS (2015) estimated that by 2035 the percentage of urban population will reach around 66.6% of the total population, or approximately 305 million people, an increase from 49.8% in 2010 . In 2015, the total population of Indonesia reached 255.5 million people, making it the fourth most populous nation in the world, with 57% of the population live in Java Island. The country has an annual population growth rate of 1.38 percent(BPS 2015). Figure 1.5 below describes the proportion, trend and projection of urban-rural population.

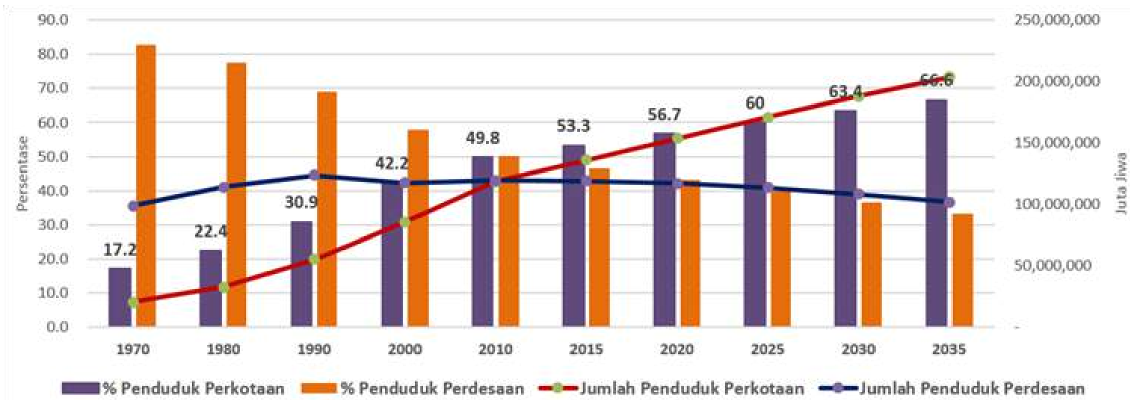


Figure 1.5Rapid urbanization and projection in Indonesia
Source: National Development Planning Board, 2014

The percentage of people living in urban areas has increased fourfold since 1961, from 14.9 percent to 49.8 percent in 2010. The year 2011 marks a turning point for the country as by that time the percentage of Indonesian population living in urban areas passed those living in rural areas. In 2015 it is estimated that the percentage of people living in cities will increase to 53.3 percent.

The Government through the Ministry of Public Works (2009recognizes four types of cities in Indonesia, i.e. metropolitan city, big city, medium city and small city. Metropolitan city is a city with a population of more than 1 million people. There are 10 metropolitan cities in Indonesia, 7 of which are located in Java (Jakarta, Surabaya, Bandung, Bekasi, Tangerang, Semarang, and Depok), 2 in Sumatra (Medan and Palembang), and 1 in Sulawesi (Makassar). Big city is categorized as a city that has population of 500,000 - 1 million inhabitants. Medium City is a city that has a population of 100,000 – 500,000 inhabitants. Small city is categorized as a city that has a population of 50,000 – 100,000 inhabitants or < 50,000 inhabitants but having an autonomous status.

In Indonesia, the distribution of population is not uniform. The population density centered around the national capital, Jakarta and nearby urban areas of Bogor, Depok, Tangerang & Bekasi (Jabodetabek). Currently in 2014, 9,3% of urban populationin Indonesia lives in Jabodetabek area, which also constitutes 16,8% of the total population of Java. The growth of population in Jabodetabek area is 3.6% per year, making it the most competitive and densely populated megacity with a GDP share of more than 25% during late 1990s and mid-2000s. The number of people live in cities of in Java Island has overpassedthe national total urban population which is 49.7%. In 2010, there were 12 cities with a population of more than 1 million, 9 of which were in Java. Six of those 9 cities were in Jabodetabek region, except for Surabaya, Bandung and Semarang (Firman 2015).

Besides Jabodetabek, there are other large urban agglomerations such as Bandung Metropolitan Area (Bandung Raya), Surabaya Metropolitan Area (Gerbangkertosusilo), Medan Metropolitan Area (Mebidangro), Makassar Metropolitan Area (Maminasata). These urban agglomerations have similar characteristics to megacities. Other than urban agglomerations, there is also rural areas that urbanized into cities (Firman 2015). This rural urbanization or known as in-situ urbanization took place since 2000 in Java islands. Thus urbanization has not always included migration or movement of people from rural to urban areas.

The annual urban population growth rate is 2.75%, exceeding the average national growth rate which is 1.17%. In 2025 it estimated that 68% of the Indonesian population will live in the cities. And in 2045 this percentage will reach 82%.

Figure 1.6 Densely Populated Urban Areas
Source: World Bank Study Team

1.4 Risk Features of Indonesian Cities

According to DIBI data (BNPB, 2016), over the last two hundred years (1815 – 2015) disaster events mostly occurred in Java and Sumatra, and to lesser extent in Kalimantan, Sulawesi, and Nusa Tenggara Islands (BNPB, 2016). This pattern is quite similar to the distribution of the population in the country. Correspondingly, disaster risk will likely be concentrated in Java islands, where mega-urbanization takes place. Hence, it is important to start investing to increase city's resiliency in this region.

The National Planning Board identifies a number of vulnerabilities faced by cities in Indonesia, that relate to the rapid growth of cities, increased disaster occurrences and climate-related hazards. These vulnerabilities are contained in the elements of the city, such as services and infrastructures, economy, social-cultural sphere, environment, governance and rural-urban linkage as elaborated in the box below (Bappenas 2014).

Table 1.1 Type of vulnerabilities the city and their underlying causes

Table 1.1 Type of vulnerabilities the city and their underlying causes

Type	Causes of Vulnerabilities
City services and infrastructures	• inadequate electricity, lack of clean water supply, and poor drainage • unequal access for people with disability, elderly people, children and women • absence of intermodal and multimodal mass transportation system which lead to traffic congestion • inadequate mode of transportation in land, river and sea which support logistics and trading goods from production centers to market in small and medium sized cities
Economy	• limited job employment creation in small and medium sized cities particularly in the informal sector • inadequate marketing infrastructure for rural products in small and medium sized cities • low productivity, little innovation and access to the use of information system
Social-cultural	• aggravating poverty, street children, narcotics, social conflicts and crime • vulnerability to emerging diseases due to poor sanitation, unhealthy life style and degraded environment • lack of connectivity between education system and job creation, employment opportunity and research • ignorance of social character, education and skills

	• ignorance of social character, education and skills
Environment	• uncontrolled urban sprawling and land conversion in megacities, metropolitans and big cities • poor control of city land use • vulnerability to floods, earthquake, tsunami, coastal inundation and sea level rise
Governance	• fragmented and little inter cities/districts coordination in the development of metropolitan areas and megacities • little public and professional participation in city development
Rural-urban linkage	• no clear linkage in the promotion and development of specific and competitive local products with rural economic development • poor transportation network and integration between the city as the centers of activities with peri-urban areas

National Disaster Management Agency (BNPB) (2013) issued the Indonesian Disaster Risk Index (Indeks Risiko Bencana Indonesia) that categorizes districts and cities to three level of risks, i.e. high, medium and low. Based on a calculation of the total score of the historical multi hazard data and the total population exposed, 136 districts and cities have been categorized as high risk.

Figure 1.7 below represents the spatial distribution of the high, medium and low risk areas of cities, overlaid with the city size. It shows in general that many cities are categorized either medium or high risks. Many cities in Java Island are in high risk category. Cities in Sumatra Island show a variety between medium to high risks. Nonetheless, most cities in Sulawesi Island and Kalimantan Island also fall into high risk category.

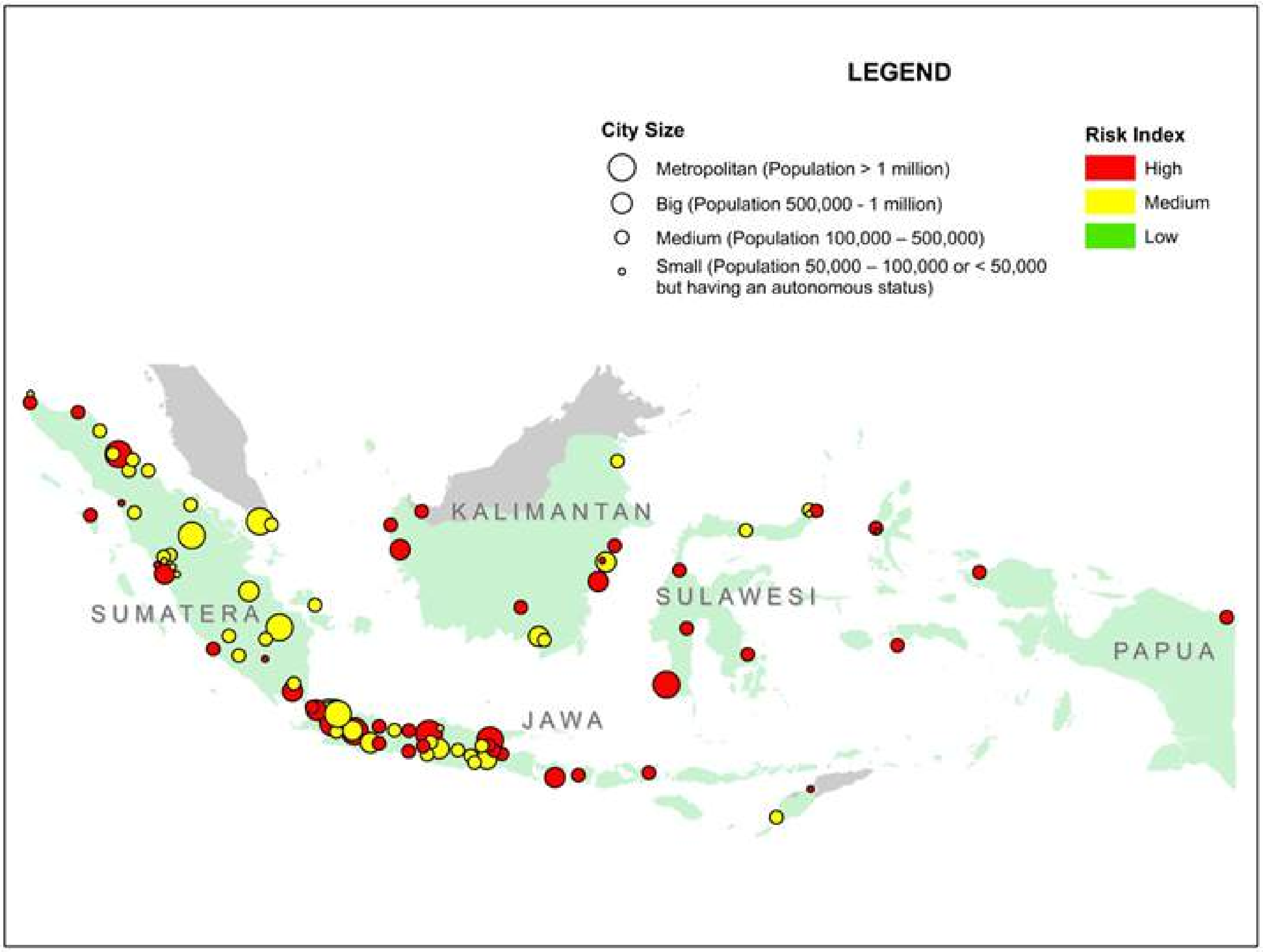
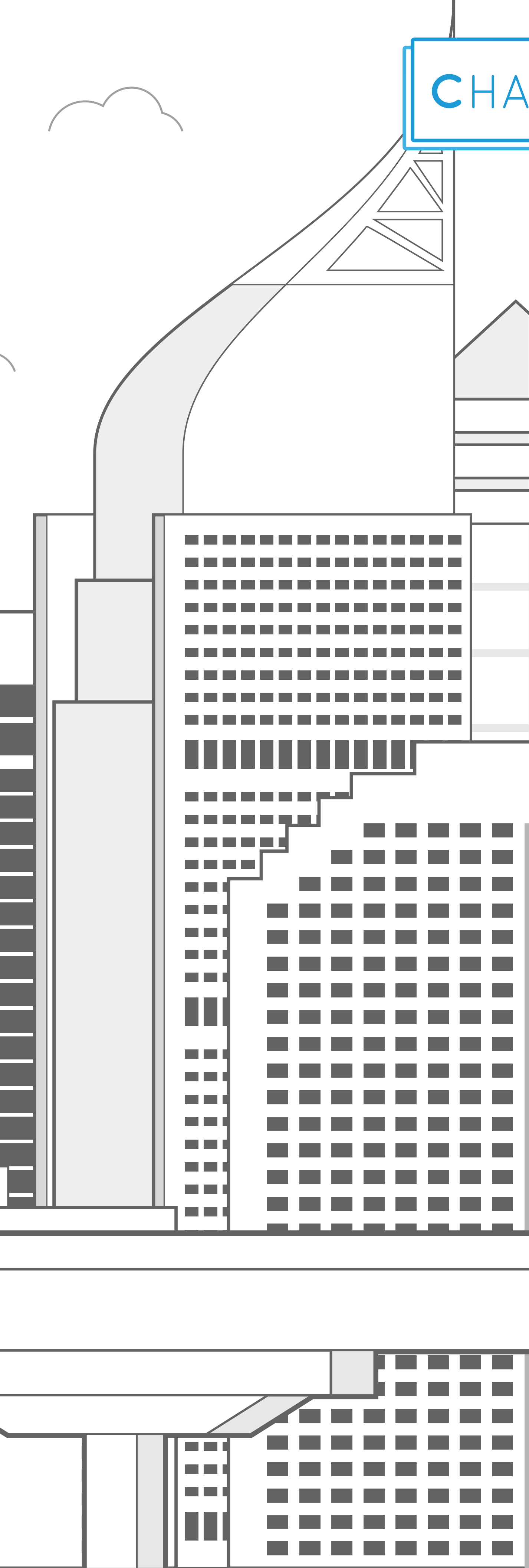


Figure 1.7 Risk Index of Indonesian CitiesSource: World Bank Study Team, based on data from Central Bureau of Statistics (BPS) and National Disaster Management Agency (BNPB)



CHAPTER 2

BUILDING URBAN RESILIENCE

2.1 Key Issues in Urban Resilience

TO BE CHANGED WITH MORE ROBUST IDEAS FROM VARIOUS SOURCES. According to UNISDR (2012), there are several significant drivers of urban resilience:

1. Growing urban populations and increased density, which put pressure on land and services, increasing settlements in coastal lowlands, along unstable slopes and in hazard-prone areas.
2. Concentration of resources and capacities at national level, with a lack of fiscal and human resources and capacities in local government, including unclear mandates for disaster risk reduction and response.
3. Weak local governance and insufficient participation by local stakeholders in planning and urban management.
4. Inadequate water resource management, drainage systems and solid waste management, causing health emergencies, floods and landslides.
5. The decline of ecosystems, due to human activities such as road construction, pollution, wetland reclamation and unsustainable resource extraction, that threatens the ability to provide essential services such as flood regulation and protection.
6. Decaying infrastructure and unsafe building stocks, this may lead to collapsed structures.
7. Uncoordinated emergency services, which decreases the capacity for swift response and preparedness.

8. Adverse effects of climate change that will likely increase or decrease extreme temperatures and precipitation, depending on localized conditions, with an impact on the frequency, intensity and location of floods and other climate-related disasters.

Therefore, development should also be based on plans that meet the specific socioeconomic and geographic conditions of a place. The low income community in urban and rural area has different scales and types of vulnerability as well as poverty characteristic.The most significant challenges faced by the poor in urban areas relate to employment, housing and social welfare (Wisnetr et al 2004). In principle, local governments are responsible for providing basic services (i.e public housing, education, healthcare and social insurance) to reduce the vulnerabilities of low-income people. The quality of these services correlates closely with the level of vulnerability of the beneficiaries. The better the quality of public service, the beneficiaries become less vulnerable and will have higher probability to get out of the poverty.

One of the underlying causes of urbanization is the motivation to seek a better livelihood and economic benefits in cities. In order to achieve this, people from rural areas migrate to the cities where economic opportunity is deemed to be better. In most cases, these job seekers migrate with limited financial ability and thus the migrants account for a large share of the urban poor in many cities. Due to their many limitations, their status can be translated as high vulnerability. Nonetheless, as migrants contribute significantly to the economic development of recipient cities, they are entitled to earn social protection from the government.In order to manage the negative impacts of urbanization, city governments have to work collaboratively with civil society and private sectors. Effective cooperation needs to be built with all stakeholders to make the city more resilient and robust in every aspect.

2.2 Basic Concepts of Urban Resilience

Resilience is rooted in many disciplines, such as psychology, ecology and engineering. It is used in many policy studies related to climate change, risk management, adaptation measures (Kelman et al 2015) and in development studies and urban and regional planning. Resilience describes the ability of a system to withstand or accommodate stresses and shocks such as climate impacts, while still maintaining its function. At an urban scale, resilience will depend on the ability to maintain essential assets, as well as to ensure access to services and functions that support the wellbeing of citizens (Dickson et al, 2012; Joerin and Shaw, 2011).

Resilient cities can only be accomplished through a concerted effort in implementing disaster risk management, climate change adaptation and sustainable urban management through a systematic action in understanding risks, identifying the capacity of the city, harnessing opportunities to prevent adverse impacts and optimizing positive benefits. This may suggest that resilience is comprised of characteristics that may be developed by the city elements, including the natural environment, the built environment and the citizen. The bigger the challenge faced by a city, the more the city is in need of a highly robust resilience concept. Moreover, the challenge faced by the city could be further augmented by the unpredictable impacts of climate change. Consequently, a city needs a resilience concept that goes beyond "bouncing back" to a bigger concept of "building back better" or "bouncing forward" (Kennedy et al 2008).

Dickson et al. (2012) mention that there are at least six characteristics that are present in resilient cities. First of all, a resilient city has the capacity to face a contingency along with its unexpected demands. They have a spare capacity, which ensures that there is a back-up or alternative available when a vital component of a system fails, to ensure service delivery. Resilient cities are also flexible or able to change, evolve, and adapt to alternative strategies in the face of disaster. They have the ability to absorb shocks and prevent failures from rippling across systems (safe failure). Resilient cities have the capacity for rapid rebound, which is the capacity to re-establish function, re-organize, and avoid long-term disruptions. Therefore, achieving urban resilience requires engaging the capacities of social agents to understand and act upon the urban systems through iterative cycles of understanding vulnerability and building resilience. Furthermore, Jha et al. (2012) categorized urban resilience into four components, infrastructural, institutional, economic, and social resilience (Table 2.1).

Table 2.1 Urban Resilience Components,

Components	Definition
Infrastructural resilience	• a reduction in the vulnerability of built structures, such as buildings and transportation systems. • the availability of evacuation shelter, health care facilities, the vulnerability of buildings to hazards, critical infrastructure, and the availability of roads for evacuations and post-disaster supply lines.

Institutional resilience	• Systems, governmental and nongovernmental, that administer a community, which able to coordinate preparedness, relief and response during emergency, as well as recovery after disaster events.
Economic resilience	• a community's economic diversity in such areas as employment, number of businesses, and their ability to function after a disaster.
Social Resilience	• Demographic profile of a community by sex, age, ethnicity, disability, socioeconomic status, and other groupings, and the profile of its social capital. • a community's capacity to do preparedness, relief and response, as well as recovery

Source: Jha et al (2012)

As mentioned earlier, concentration of people, assets, and economic activities in cities has increased exposure to the impacts of natural hazards and climate change. City residents are particularly vulnerable to earthquakes, landslides, floods, rising sea levels, and storm surges. In addition to making hazard events more frequent and more intense, climate change has also posed the risks of prolonged drought and extreme heat. Figure xx below shows the changing pattern of natural disaster by comparing data from 1903-1962 and 1963-2012. Compared to the set of data from the first period, the second period shows that weather-related events other than storm have increased significantly from 24.9% to 48.2%. To build resilient cities amidst this changing pattern of natural disasters, city governments will need to engage in disaster risk management that is more accommodative to emerging risks.

Baker (2012) maintains that disaster risk reduction and climate change adaptation have many In more operational meaning, the Government of Indonesia through BNPB adopted "ten essentials for making cities resilient" approach that was developed by UNISDR (2012). These ten essentials are as follows:

1. Organize for disaster resilience,
2. Strengthen financial capacity for resilience,
3. Identify, understand and use current and future risk scenarios,
4. Pursue resilient urban development and design,
5. Safeguard natural buffers to enhance the protective functions offered by natural ecosystems,
6. Strengthen institutional capacity for resilience,
7. Understand and strengthen societal capacity for resilience,
8. Increase infrastructure resilience,
9. Ensure effective disaster response, and
10. Expedite recovery and build back better.

2.3 Rapid risk diagnostic tool

To understand the possible disaster risk and climate change impact, a rapid diagnostic tool can be used to obtain a quick overview of risks (Gunawan et al 2015). A rapid diagnostic tool has been tested and developed by the World Bank (2015) in several Indonesian Cities. Rapid risk diagnostics can be used to initiate a conversation among city officials and stakeholders on disaster and climate risks (e.g. their general spatial distribution, and their potential relations to the city's growth pattern and trends). The rapid risk diagnostics can utilize available tools to be pin pointed such as: low resolution data or atlas, records of event occurrences as remembered by the residents or captured in the news, and information on the city's on-going and planned development investment, specific geographic areas around natural hazards and investment locations. It should be follow by a more detailed and thorough risk assessment in much smaller geographic areas. Only at this stage, generating new and higher resolution data will be more manageable and less costly.

Rapid risk diagnostic tool has 5 key steps:

1. reviewing the overall spatial structure of the city, which includes the core of the city, economic base and spatial agglomeration;
2. reviewing the growth pattern and growth direction of the city, which presents the growth trends, spatial distribution and direction;
3. reviewing the pattern of disaster occurrences (i.e. types and frequency of hazards, and pattern of disasters),
4. identifying major urban investments, types of investments and their locations and impacts to vulnerability reduction;
5. formulating city risk profile, which presents the locations of risks, investments and the option of resilient measures to be taken.

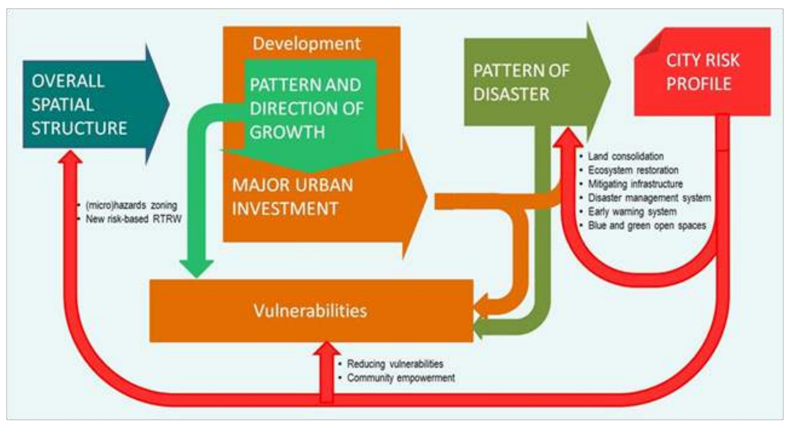


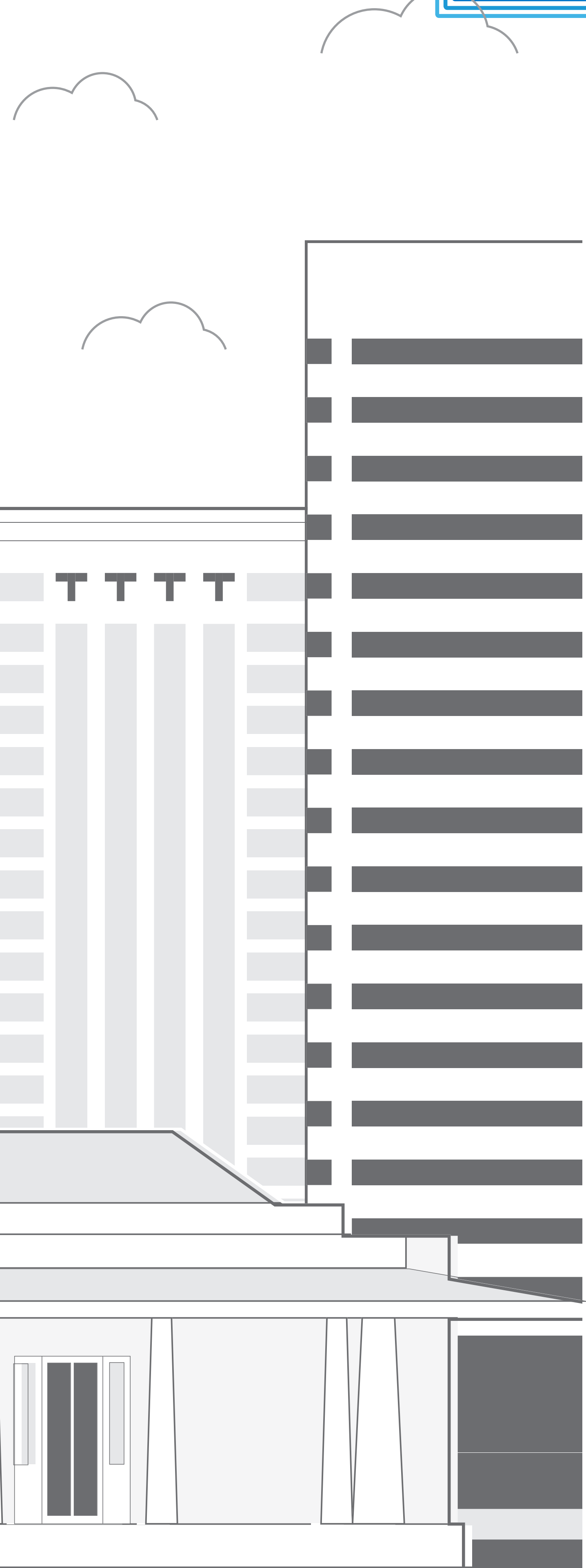
Figure 2.1 elaborates concept of rapid risk diagnostics, which emphasizes the interrelationship between development, vulnerability and resilience options. This approach takes into account the disaster patterns that may shape the overall spatial structure. On the other hand, the city has vulnerable areas or elements that were formed by urban development practices and societal activities over a long period of time. The interplay between disaster patterns and vulnerability areas creates urban risks, which may be reduced by lessening vulnerability and reengineering the spatial

structure of the city. For that purpose, city needs to incorporate resilience principles into major urban development and investments particularly in high risk areas or elements.Rapid risk diagnostics have been piloted by World Bank and Bappenas in six cities in Indonesia, i.e. Balikpapan, Denpasar, Makassar, Palembang, Semarang, and Yogyakarta.

Figure 2.2Rapid Risk Diagnostic Pilot Cities in Indonesia
Source: Gunawan et al 2015

CHAPTER 3

NATIONAL POLICY FRAMEWORK FOR BUILDING RESILIENT CITIES



3.1 Towards Resilient City Policy

Figure ↱3.1Timeline of Policies Related to Urban Resilience Source: World Bank Study Team

The development of national urban policy in Indonesia may be seen as milestones towards resilient city. The initial attention was on environmental related issues (sanitation and cleanliness), followed by health issues. Later, the approach becomes more comprehensive from livable city, green and sustainable city, resilient city and smart city (Figure 3.1).

Since the 1980s Indonesia has implemented programs that address various aspects of city problems and challenges. In 1986 the Ministry of Environment launched the Adipura Program, which provides awards to cities and districts that have been successful in maintaining cleanliness and good environmental management. Aspects that are assessed through this program include waste management, tree cover, green open space, and water and air pollution control. The program evaluates both the physical and institutional-management aspects of cities and districts. Since 2015 Adipura Program has also been geared towards achieving sustainable city goals (Permen LH 6/2014).

The Ministry of Health initiated the Healthy District/ City Program (Program Kabupaten/Kota Sehat) in 2005 through a joint Ministry of Home Affairs and Ministry of Health Decree Number 34/2005. This program, which adopts a WHO-led program that has been implemented in developing countries since the 1980s, is meant to operationalize sustainable development through the development of cities and districts that are healthy and environmental friendly. Some aspects and indicators of the program are similar to those used in the Adipura Program (Ministry of Home Affairs and Ministry of Health, 2005).

Since 2011, the Ministry of Public Works has implemented Green and Sustainable City Program. The program aims at promoting city and regional development that will not undermine the environmental assets of the regions. The Green and Sustainable City Program tries to support the enforcement of Spatial Planning Law in terms of allocation of 30% of city and district areas as green open spaces. Through the program cities and districts are expected to prepare a green map and a master plan for green open space, and organize public campaign and education as well as capacity building efforts for environmental friendly urban development. The program also promotes the advancement of 10 Initiatives from Bali Forum for Sustainable Urban Development that include city management, institutional capacity, control of urban population growth, disaster and climate change mitigation, urban economy, heritage, housing and settlements, green cities, revitalization of waterfront areas and urban transportation(PU, 2011).

The National Agency for Disaster Management (BNPB) launched the Resilient City Program in 2012. Employing the UNISDR Local Government Self-Assessment Tools (LG-SAT) for City Resilience, the agency tries to engage city and district governments to assess their progress in implementing disaster risk reduction (Perka BNPB 1/2012). The results of this exercise are meant to inform the local development planning process, as a way of mainstreaming DRR into local development plans. On November 28th 2015, BNPB stated their commitment towards realizing Central Java Disaster Resilience Province . In addition to that, some other cities' have already taken steps for achieving disaster resilient cities, such as Bima , Bogor , Makassar , Klaten and Denpasar .

A similar approach has been taken by the Association of Indonesian Planning Experts that adopts the Most Livable City Index (MLCI) to encourage cities to engage in sustainable urban development in the end of 2009. The index shows level of how comfortable city inhabitants about living in their city. The index is acquired through survey towards 1200 citizens of 12 Large Cities in Indonesia. Criteria used in this survey are based on National Symposium: Future of Indonesian Metropolitan Cities in Medan, 4th December 2008; with seven main variables: physical, environment quality, transportation—accessibility, Facilities, Utilities, Economic and Social. This index serves as evaluation for local government and its citizens to increase their cities' livability (Muttaqin, 2010).

In 2014, the National Development Planning Agency (Bappenas) collaborated with the World Bank to develop a disaster and climate change resilience framework for urban development. The World Bank assisted Bappenas in conducting technical discussion among the local municipalities through floor group discussions (FGD) and consultation activities throughout 2014. The consensus is then incorporated and reflected in the National Medium Term of Development Planning (RPJMN) of 2015-2019 in the urban development sector.

Smart City Program constitutes the latest city-related program launched in the country. Declared by city mayors from the Asian and African countries at the commemoration of the Asia-Africa Conference in Bandung in 2015, the program aims at developing a sustainable and smart city by establishing knowledge networks and sharing of technology among local governments, academia, business, industry and communities. A smart city implements smart governance, smart economy, smart mobility, smart living and smart environment. Many cities have been involved in this initiative, but it seems that most of these cities have only focused their efforts in using information technology to facilitate their service delivery (Giffinger et al, 2007). In August 2015, Institut Teknologi Bandung (ITB) collaborated with Kompas newspaper with support from PT Perusahaan Gas Negara (PGN) awarded Smart City (Kota Cerdas) 2015 in Indonesia. The award was given based on Indonesia Smart City Index (IKCI), comprising of several aspects, such as economy, social, environment. This activity is also supportedby Ministry of Public Works and Housing by Green City Program (PU, 2015).The smart city concept is supported in conjunction with the idea to increasing city government ability in facing ASEAN Economic Community challenge.

National Mid Term Development Plan on Urban Development

The National Medium-term Development Plan 2015-2019 maintains that the national policies for urban development will be geared towards sustainable cities that have the necessary physical characteristics, economic potential and vibrant local culture (RPJMN 2015-2019). Based on experiences from the above city level initiatives, national government endeavors to formulate an integrated long-term policy for urban development. This mid-term plan is based on a concept developed by Bappenas (2014) on establishing a dynamic balance of growth among metropolitan cities, and big, medium, and small cities. With this policy, the growth of big and metropolitan cities will be controlled and directed towards the acceleration of rural-urban economic development.

The National Medium-term Development Plan 2015-2019 outlines three major categories of cities, i.e. livable cities, green and resilient cities, and competitive and smart cities. Indonesian policy for urban development in the next five years will be focused on improving people's productivity, leveraging global competitiveness, and developing the country from the fringe by strengthening and improving competitiveness of the regions and villages. Figure 3.2 below depicts urban development priority in Indonesia 2015-2019.

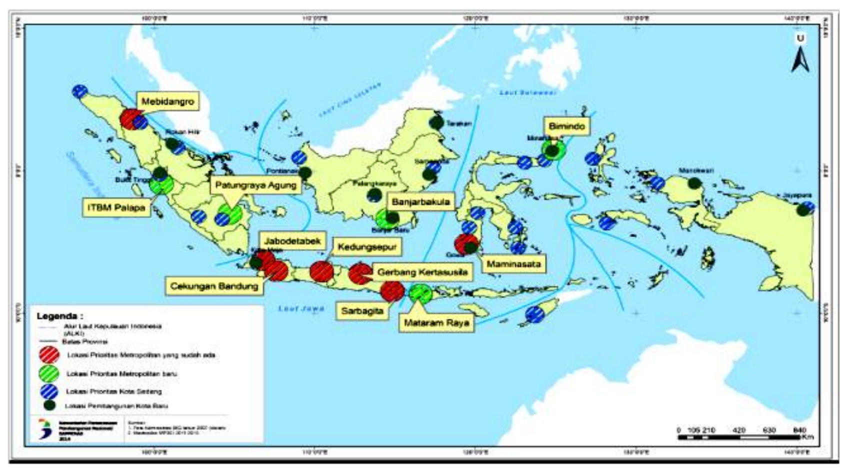


Figure 3.2Urban Development Priority in Indonesia 2015-2019

Source: Bappenas, 2014

The National Planning Board has also set-up urban development targets that have to be reached by 2019 as followings:

1. Urban systems for discrepancy reduction realization;
2. Urban service standard fulfillment;
3. Building secure, comfortable and livable cities;
4. Develop climate change and disaster resilient green cities;
5. Develop competitive and ICT-based smart city;
6. Build a transparent, accountable, participative and professional urban management capacity.

Although Indonesia has not set a resilient city roadmap or pathway, sectors related to resilient city are recognized in the national mid term development plan 2015-2019 (Table 3.1).

Table 3.1 Sectors related to Resilient City Issues in National Mid-Term Development Plan

Table 3.1 Sectors related to Resilient City Issues in National Mid-Term Development Plan

#	Sector	Policy
1	Road and Transportation	• Green transportation – Environmental friendly transportation Urban Mass Transport
2	Energy	• Energy security • Water resource use as electric energy source. • Water resource management for electricity
3	Water & Sanitation	• Green waste • Green water • Ensure water security • Reduce water pollution
4	Water Resource Management	• Green water • Increase efficiency of surface water • Water resource conservation for vegetative • Reduce critical land • Integrated watershed management in Local Spatial Planning • Build water reservoir • Flood, sediment/lahars and coastal security control structural solution. • Structural measures in flood control, volcanic lava flood and beach abrasion • Surface water quality management • Community resilience in reducing risk of water-related disaster • Sustainable development of beach area • Innovation and technology to support sustainable water resource management
5	Housing , Settlement, Buildings	• Affordable housing • Slum alleviation and prevention • Land management for housing

	Environment	
8	Disaster	• Internalization of disaster risk reduction into sustainable development • Reduce vulnerability • Capacity building in disaster management • Climate change response and strengthening disaster information quality
9	Marine	• Welfare improvement through Marine resources management for people at coastal area
10	Urban	• Development of smart city based on technology • Establishment of new town and development of new Metropolitan outside Java • Development of green city with resiliency against disaster and climate change
11	Land Use	• Infrastructure development on disadvantaged area • Infrastructure acceleration development for outskirt region • Increase community participation into spatial planning process and decision • Integrated spatial planning system • Development of national spatial data infrastructure

3.2 Building resilience in coastal areas

As an archipelagic country with more than 17,000 islands and a coastline of more than 95,000 km, coastal cities in Indonesia faces the growing risks of sea level rise, salt-water intrusion of aquifers through storm surge and high land subsidence. The sea-level rise was projected to increase 35-40 cm of sea surface relative to year 2000 (ACCRN, 2016). Coastal inundation due to sea level rise has caused significant problems along coastal zones where about 50-60% of total population resides, which may cause displacement and internal migration. The inundation could impact the industry, agriculture and fisheries productivity and thereby affecting household employment (ACCRN, 2016).Large numbers of major cities in Indonesia are coastal cities that are located in Low Elevation Coastal Zone/LECZ (zone with altitudes of less than 10 meters above sea level), such as coastal cities in Java, such as Jakarta, Cirebon, Semarang, Surabaya and Medan. In short, strategic infrastructure for national welfare are located in these areas.

Currently, there is about 61 coastal cities in Indonesia (KPPOD, 2013). In these coastal cities, climate change could impact the key sectors including marine fisheries, water access, health, agriculture and forestry (Bappenas, 2010). In the water sector, climate change could cause water resource scarcity, flood, landslide, and drought. It was reported that from 2000-2010, these hydrological disasters caused 4,936 casualties and impacted 17.7 million people, which accounted to 80% of all disaster experienced by Indonesia. These disasters could increase the vulnerability of the people, especially those live in coastal cities. A lot of coastal cities Indonesia have also experienced land subsidence due to over exploitation of ground water. Therefore, some very low-lying areas in some cities have even been submerged completely.

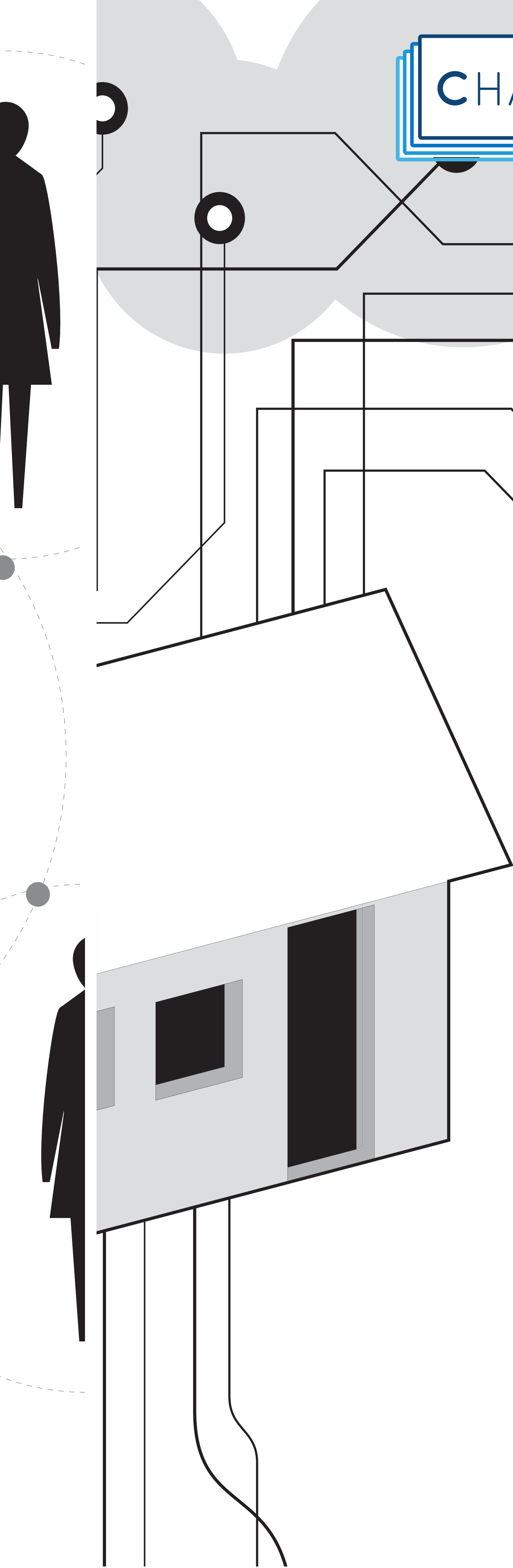
Recognizing the important role of coastal cities in the country's economy, the national government has formulated some strategies to develop resilient coastal cities, among other through the integration of climate change adaptation into coastal planning in cities and districts that are located in coastal areas. Integrated management of coastal zones, small islands and marine ecosystems will be implemented, including through physical adaptation in coastal zones and small islands (Bappenas, 2010). The Mid-term National Development Plan 2015-2019 outlines a number of national development programs in Marine Sector to enhance the prosperity of people living in coastal areas. To reduce the people's vulnerability and increase the social economic condition of people living in coastal areas, the government will build eco-fishing ports and national fishing ports, as well as strengthen sea transport connectivity and develop marine-based energy.

Ministry of Environment, Indonesia Second National Communication Under the United Nations Framework Convention on Climate Change (UNFCCC), 2010

Tabel 3.2 Land reclamation as a measure of coastal management in Indonesian cities

City	Project
Jakarta	Mega Projects of Giant Sea Wall and reclamation of Jakarta bay as an effort to reduce the impact of sea level rise, as well as to provide more space for development area (the project is still on-going).
Makassar	Reclamation of Losari Beach (Center Point Indonesia) is an implementation of the concept that integrate modern city with residential and public services area. (Projects in still under discussion in the legislative forum).
Balikpapan	Reclamation of coastal road, which provide higher access of transportation along the south coastal area of Balikpapan in addition to integrate central business district, residential and service areas, as well as government offices (the project is in progress).
Manado	Reclamation of Manado Bay (Boulevard) is an effort expand the land area of the North Sulawesi Province in order to provide more residential area and protect the city from tidal waves (the project has been completed, now is entering the development stage).
Denpasar	The government of Bali is planning to do reclamation of the Benoa Bay to reduce siltation, expanding the services area and protect mangrove ecosystems.

Source: World Bank Study Team

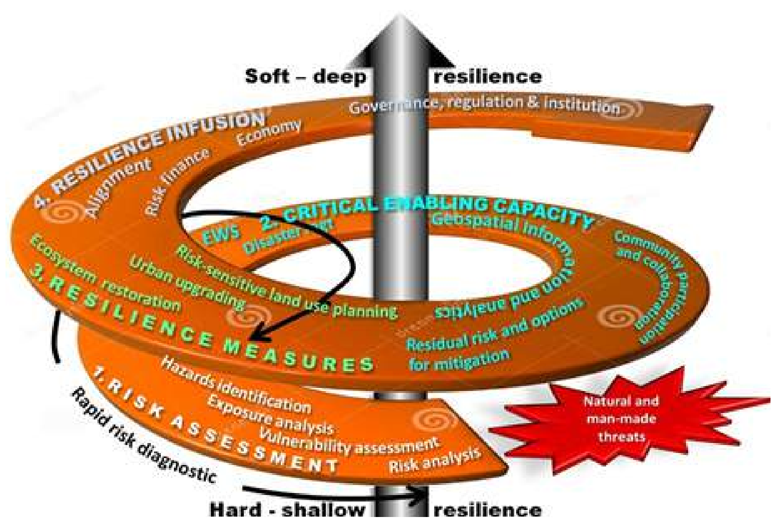


CHAPTER 4

KEY PHASES TO MAKE CITIES RESILIENT

3.1 Roadmap for Resilient Cities 2015-2025

Urban resilience helix (URH) is a concept for achieving urban resilience (Figure 4.1). It consists of four phases of Urban Resilience Approachthat offers key elements and steps that may be needed to build resilience.Such a helix illustrates the sequential phases to be followed up systematically and practiced to obtain the sustainable city resilience through It provides options for urban planners and city managers from hard (and "shallow") resilience intervention to soft (and "deep") intervention to build resilience.



URH starts with risk assessment (Phase 1),Critical enabling capacity (Phase 2) , developingresilience measures (Phase 3) and sustaining resilience infusion (Phase 4). Each of these phases is ellaborated into several steps as shown in Figure 4.1. An alternative of the comprehensive phases suggested above, a short cut (black arrow) from phase 1 to phase 3 is possible considering the urgent needs of the community and areas to counteract imminent risks. This short cut can be done through rapid risk diagnostic tools

4.1 Phase 1 - Risk Assessment

The goal of risk assessment is producing clear spatial mapping of the possible impacts of disaster and climate change. The spatial mapping consist information about the distribution of in the form of spatial distribution of the probability or likelihood of disaster events occurring, as well as the damage and loss that will be incurred from the respective events. In order to do risk assessment, Jha et al (2012) summarizes fourcore elements which are hazard identification, exposure analysis, vulnerability analysis,and risk analysis. In URH, these four elements of risk assessment is seen as steps in carrying out risk assessment.

In Indonesia, National Agency for Disaster Management issued a general guideline on risk assessment through the Head of BNPB Decree 2/2012. The decree specifies the government approach in risk assessment, which is based on three variables: level of hazards, level of vulnera-bility and community's capacity. Risk assessment, according to the decree, provides a basis for the implementation of disaster risk management measures in a given area.

Step 1- Hazard Identification

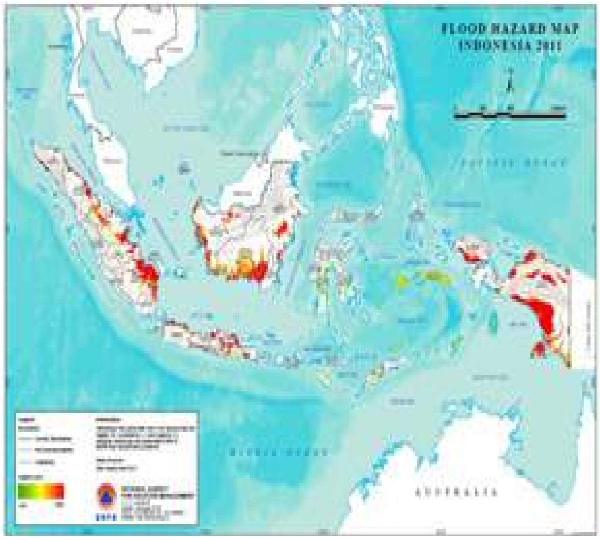
Hazard identification refers to the quantification of hazard parameters such as probability of occurrence, intensity, speedof onset and areas potentially impacted. Hazard events may come from nature as well asfrom human-related acts. Activities in hazard identification include construction of probabilistic hazard models, which is especially necessary to characterize hazard that extends beyond the limited historical record of observed events. It can also be used to model how climate change may affect disaster occurrence. The other activities may include formulation of catalogues of historical disaster events and hazard mapping. Hazard mapping is the most common form of hazard identification, which is recommended for urban investment projects. Hazard mapping enable the identification of areas at risk, hazard frequency, duration, extent, and speed of onset, spatial dispersion, temporal spacing, and the possibility of secondary hazards (Jha et al 2012).

Hazard trends need to be identified so that changes in the patterns of frequency, seasonality, location and intensity can be identified, thus allowing prediction based on programming to be made. Many hazards are not completely random events but are the consequence of other forces, such as climate change (Concern, 2005). Thus a thorough recording of all factors that could contribute to hazards should be made, such as the nature, locale, intensity and probability of at least three types of hazards (i.e natural, technological and other man-made hazards) (UNISDR, 2012). The following figure shows example of hazard analysis of flood and extreme weather in Indonesia (Figure 4.2).

Step 2 - Exposure Analysis

In this stage the identified hazards will be overlayed with the elements at risk, which are population and economic assets and economic development projection. The assets exposed may include buildings, infrastructure, crops, and people. These variables are measured to how likely they sustain loss or damage in the event of a disaster, as well as how severe the damage will be. The projection of damage assessment is measured by collecting information regarding the physical characteristics (e.g. two-story masonry house), monetary value (replacement cost or actual market value), and location (street address, latitude and longitude coordinates) (Jha et al 2012).

Step 3 - Vulnerability Analysis



Exposed elements such as people and households, physical and economic assets, environmental services and critical infrastructures may inherently have vulnerability to disaster. Vulnerability analysis tries to quantify how susceptible exposed populations and their assets are to different hazard intensities. This analysis may include estimation of the likely human casualties that may be incurred by disaster, and the potential damage and loss of assets that may be caused by disaster. Historical data on disaster loss are vital for understanding how specific disasters impact populations and infrastructure. If the necessary data do not exist, however, engineering-based analytical models can be used to estimate disaster impacts (SOURCE).

Step 4 - Risk Analysis

Risk analysis provides a spatial assessment of risk based on hazards, vulnerable population, and the ability of the community to cope with disasters. Risk analysis must estimate losses of human life as well as direct and indirect economic losses. The direct losses are more straightforward to evaluate using standard relationship between the severity of the hazard event, location of the damaged assets, and occurrence of damage of certain severity, but other disaster consequences that are harder to quantify can contribute significantly to the risk an urban infrastructure investment seeks to mitigate (Jha, 2013).

4.2 Phase 2 - Development of Critical Enabling

Phase 2 addresses the critical enabling factors that need to be developed by city governments, including geospatial information, disaster risk management framework, and community participation and collaborators.

Step 5 – Strengthening Geospatial Information

Geospatial data provide valuable information that can be used to understand risk better. The geospatial data acquired from remote sensing provide a perspective of the built environment and its exposure to hazards. However, despite the presence of high-spatialresolution of satellite sensors, remote sensing is still underutilized, especially in developing nations. Limited understanding of the benefits and a lack of technical training have made it an often-overlooked or latent resource (Understanding Risk, 2014). There is a need for multi-level geospatial information to support improved decision-making. In addition multi-level modeling will enable development of crisis scenarios and impacts on social systems, according to chosen prevention and response actions (Aubrecht et al, 2012).

Therefore, developing the capacity for using geospatial data and information is a one of the key prerequisites in decision making for developing resilient cities. Decisions to prioritize resilience efforts may be greatly helped by spatial and temporal understanding of risk, which may be facilitated by GIS tools, which enable the decision makers to quantify the impacts of planned or proposed investments in reducing risk. Thus GIS tools provide sustainable risk information systems and analytical tools to allow systematic and evidence-based understanding and communication of risk. Geospatial risk information needs to be made available in a user-friendly format, to inform long-term decision making as well as to enable all stakeholders to actively participate in reducing and preventing disaster risks (Jha, 2013).

Step 6 - Establishing Disaster Risk Management Framework

Disaster risk management framework includes the management of long-term exposure and damage reduction, short term damage prevention through early warning system, damage mitigation through contingency capacities, and the establishment of sustainable recovery structures as depicted in Figure 4.5 below.

In identifying risk, there are two steps involved, risk assessments and risk communication. Risk identification becomes a foundation and is necessary in order to proceed with the following steps. Reducing risk involves avoiding any creation of new risks and reducing present risks. Risk reduction can be done using structural and non-structural measures, for example: improving infrastructures, land use planning, policies and regulation. Preparedness is needed to improve the urban capacity in managing and undergoing crises. Increasing preparedness can be done with development of early warning systems, support of emergency measures and contingency planning. Financial protection can be done by assessing and reducing contingent liabilities, budget appropriation and execution, ex-ante and ex-post financing instruments. The last pillar is resilient recovery and reconstruction policies; whose goal should be set on building back better (World Bank, 2012).

To conclude, activities to implement disaster risk management framework should include awareness building for the public, formulation of City Resilience Action Planws, set-up of Early Warning System, formulation of Emergency Response Plan,

Figure 6: An operational framework for managing climate and disaster risk

Source: The Sendai Report (World Bank 2012c)

establishment of Emergency Operations Center, disaster preparedness training exercises, interoperable communication systems and risk communication.

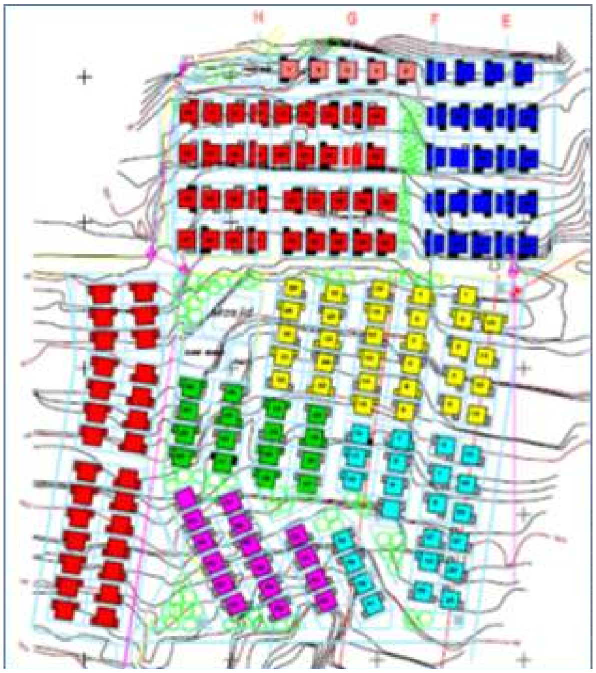
Step 7 – Encouraging Community Participation and Collaboration

Participation of communities and other city stakeholders is critical in building resilient cities. Experiences have shown that community-driven programming is essential in the success of urban planning and infrastructure development. It is also vital to ensure that the most vulnerable and marginalized populations will have access to full and meaningful participants in all processes related to urban development. With the limited capacity of local governments in addressing disaster risk reduction and climate change adaptation, all level of urban society should support direct resilience-related actions.

Deliberation is a form of community participation in planning process, where a discursive approach in used in decision-making. In deliberation, citizens would gather in a non-coercive environment to identify and discuss public problems and possible solutions. It offers a different structure, resulting substance, and civic benefits. Through deliberation, the public could have a better and common understanding of underlying issues, make substantively better policy recommendations, reduce friction, and at the same time empowering citizens. (Deliberative Democracy Consortium, 2004)

The Government has showcased community participation in several post-disaster projects in Indonesia. In collaboration with local disaster management agency, the Ministry of Public Works led the rehabilitation and reconstruction of housing and settlements of over 100 villages impacted by the Merapi eruption in 2010. The government outlines policy of community-based development plan that enables village members organizing themselves in respons to disaster impacts by establishing the Community Settlement Plan to improve village's social and environmental condition and strengthening disaster prearedness.

The community settlement plan preceeded by preparation of Basic Map. It was a formal map scale of 1:2000 collected from local agencies that contains geographical features of the affected villages. The commmunity held a Self Survey that capture information on damage and loss to make profile of affected areas into thematic maps. The thematic maps offer critical information for analysis which threreafter discussed among village stakeholder to bring about Program Indicators into design of Community Settlement Plan. (The Standard Operating Procedure of Community-based Settlement Rehabilitation and Reconstruction Project, Ministry of Public Works 2011)



4.3 Phase 3 – Implementing Resilience Measures

Resilience measures consist of Risk-sensitive Land Use Planning and Ecosystem Restoration. Examples of implementing resilience measures are as follow: revising land use plans to take into account the results of risk assessment, detailed land use zoning in targeted development areas based on hazard micro zonation or other instruments governing site allocation and control. It represents actual soft and short and medium-term interventions to obtain resilience. Resilience measures are physical and non physical actions that are important to anticipate potential hazards that may be caused bythe dynamic development of an urban area (Gunawan et al, 2015).

Step 8 – Risk-sensitive spatial planning

Risk-sensitive spatial planning is a nonstructural approach that identifies the safest locations for urban development and creates regulations for guiding it. It is carried out by identifying exposed and vulnerable areas and quantifying the possible impacts of disaster and weather events. The possible impacts are further detailed in spatial distribution of damage and loss and the probability or likelihood of adverse events occurring. Activities in this step include local risk assessment that collects information about which parts of the city that might be affected by a certain hazard (e.g. a coastal area with tourist facilities that might be affected by sea-level rise). Another activity is a proper development of spatial plan. A spatial plan may take the form of land classification, future land use, a statement of policy, or a land use management plan, or a mix of all these.

In conducting risk-sensitive spatial planning, new developments and critical infrastructure needs to be steered away from hazard-prone areas through better land use planning and zoning. Spatial planning should be coupled with enforcement of building codes, to ensure that there is adequate supply of "safe" land available for commercial, industrial, and residential subdivision development. This is also includes zoning for conservation purposes (ADB, 2013). Cities will also need to promote resilient design, safer construction and strengthening of non-engineered buildings, and build the technical capacity and competence of local enforcement officials, builders, tradesmen and practicing professionals to promote compliance with regulations, plans and building codes.

An example of a risk-sensitive spatial planning is Bendali projects in Balikpapan. Bendali is an abbreviation of Bendungan Pengendali Banjir or Flood Controlling Dam. As stated in the master plan of Balikpapan City, there should be 55 units of Bendali developed, although until now six units of Bendali have been developed, which overall aim to reduce the frequent flash flood and landslide in the city due to its hilly topography. The developed dams are located in the water catchment area to increase the water recharge into the groundwater aquifer. To reduce the possibility of transferring household and solid waste into Bendali, a couple of reservoirs were located preceding the dams in order to reduce the risk of sedimentation.

Step 9 - Ecosystem Restoration

Ecological restoration focuses on establishing the composition, structure, pattern, and ecological processes necessary to facilitate terrestrial and aquatic ecosystem sustainability, resilience, and health under current and future conditions (US National Forest Service, 2014). Natural ecosystems such as mangrove forests, watershed areas, urban forests, tree stands, and parks may provide protection against tsunamis, landslides, erosion, floods and hence can decrease the risk of urban infrastructure projects. Likewise, ecosystem management strategies such as watershed management, green and blue infrastructures and environmental buffers, can reduce the vulnerability of a city to disasters and enhance urban resilience (Jha et al. 2013). It is therefore important to make use of natural infrastructure and restore the natural urban ecosystems to decrease the costs of building resilient cities.

Ecosystem restoration cannot be achieved without the participation of all city stakeholders. City governments need to raise people's awareness of the impact of environmental and ecosystem degradation to disaster risks, as well as educates the public about the negative consequences of global warming and climate change. They will also need to review the environmental consequences of existing plans, policies and programmes, mainstreaming ecosystem considerations into the future planning processes, and tackling drivers of environmental degradation. They may also incorporate ecosystem-based flood reduction measures into engineered infrastructure to support coastal protection, upstream reforestation, wetland and river bank restoration, and floodplain regulation to achieve resilient urban development goals. All these initiatives may be done through collaboration with the non-government and the private sectors, including building partnerships with the private sector to leverage technical and financial resources and ensure that private investments follow environmental and risk reduction norms.

Step 10 - Urban Upgrading & Structural Mitigation

Urban upgrading refers to the efforts to improve the condition of the urban most vulnerable group. It prioritizes investments in infrastructure, housing, livelihoods, and social networks for the urban poor (Jha et al. 2013). Comprehensive urban upgrading reduces risks through slum upgrading and prevents new slum formation by using incentives for private sector and community engagement to increase the supply of low-income housing; it also provide opportunities and empowers the slum dwellers. Slum areas are vulnerable to external hazards and at the same time also face internal slow-onset hazards caused by unhealthy environment, sub-standard infrastructure and utilities and over-crowded spatial arrangements.

As part of urban upgrading, cities need to protect critical infrastructure and develop new resilient infrastructure. They also need to plan for business continuity to ensure that lifelines and services can be quickly restored or still functional during disaster emergency (i.e hospital). This could be achieved by applying minimum criteria and standards of resilience into urban design.

On the other hand, structural mitigation can play key role in reducing disaster risk by providing physical intervention in the hazard system. Nonetheless, exclusive reliance on structural measures will ultimately prove ineffective and must be done along

Figure 4.8 Making Gabions and River Embankment as part of Structural Mitigation along Winongo River

with nonstructural measures, such as law and regulations (Ghesquiere et al, 2012). Consequently, authorities should build their capacity to understand risk and incorporate their understanding into building codes, land use regulations and spatial planning (Jha, 2012). In this way, the resilience of urban development can be achieved by maintreaming structural mitigation into planned or on-going urban upgrading programs.

4.4 Phase 4 – Sustaining Resilience Infusion

After going through the three previous phases, city governments need to come to an agreed scheme of interventions which will finally be visible and beneficial for the society. All the results from the three phases need to be permeated into their supra and infrastructural systems through regulations, best practices and continuous learning for continuous improvement. Resilience infusion needs to be conducted at least through urban upgrading, notably in slum areas and retrofitting of the city by incorporating healthy and prudent risk financing and risk transfer system.

Step 11 - Financing Risk and Resilience Investment

Comprehensive disaster risk management cannot be achieved without a good financial strategy. Although they do not reduce the amount of damage and loss, disaster risk financing and insurance instruments can protect against the financial impacts of disasters. In order to deal with climate and development uncertainties, national stakeholders need sustained and flexible programs, which require clear institutional frameworks and predictable, long-term financing (e.g over at least a decade). The fact that climate affects many sectors introduce added complexities in many countries where governance systems are structured along sectoral lines (World Bank, 2013). The economic and financial impact of disasters can be assessed with financial risk assessment and catastrophe risk modeling tools. There is a series of financing instruments and services available to local governments and cities, such as sovereign disaster risk financing, risk retention, catastrophe risk insurance, catastrophe risk , market development, alternative risk transfer and disaster micro-insurance (AMCDRR, 2012).

The example of resilience investment can be found in the Kupang City DRR and CCA action plans (UNDP, 2015). In this document, the each strategy for DRR or CCA is designated to the related institution along with the budget allocation from the Regional Government Budget (APBD). For instance, the building of flood defenses is designated under the Department of Public Policy, whereas the management of the city's green space is under the Department of Sanitation. Likewise, the Department of Housing and Regional Infrastructure of Yogyakarta municipalities undertake the slum upgrading program of 7 sub-districts in 2016. Thus, the urban resilience program does not have to be specified under DRR or CCA program but can be incorporated or added into routine or on-going development program.

Step 12. Governance, regulation and institution

Resilience can be achieved through governance, regulation and institution. Governance is about how the governments and other social organizations interact, how they relate to citizens, and how decisions are taken in a complex world (Graham et al, 2003).

Through governance, regulation and institutions, any efforts on reducing risk and such can actually have legal power and authority. Under this condition, disaster risk reduction can be mainstreamed into planning procedures for infrastructures projects as discussed in Step 10 above.

In addition, urban planning can act as a tool for risk reduction given that the basic philosophy is geared into DRR by incorporating several measures as follows: environmental planning, defensible city, responsible architecture and urban disaster governance (Wamsler, 2006). Urban environmental planning in this case means to inter-connect urban planning and broader environmental aspects. Defensible city means integrating the concept of community protection against natural disasters as a key aspect of urban planning. Responsible architecture aims to target informal settlements and to combine large-scale structural improvements with participatory small-scale measures. Urban disaster governance means combining knowledge and management of disasters and urban planning to create joint governance practices.

In general, the GoI have designed the action plans for the National DRR and CCA (known as RAN-API-PRB), which acts as the guidelines for the local governments to developed the local DRR and CCA action plans (known as RAD-API-PRB). For instance, the Kupang municipality managed to develop the RAD-API-PRB in 2015.

CHAPTER 5

URBAN RESILIENCE PRACTICES

The following chapter elaborates some urban resilience practices that have taken place in Indonesia. Some of these case studies are initiated by previous World Bank projects. The case studies are examples of how urban resilience have occurred in Indonesia.

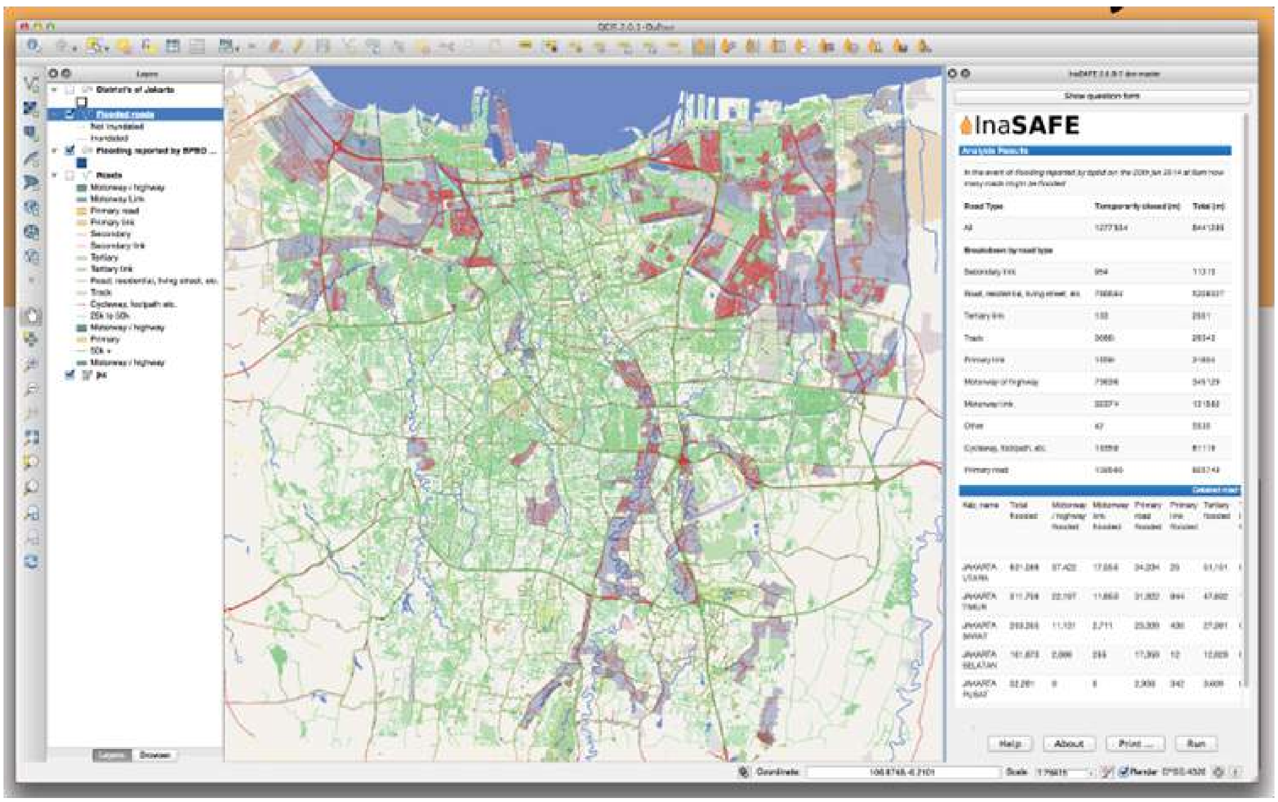
5.1 Urban Risk Assessment Practices: Strengthening Jakarta Risk Information to Flood

As the capital of one of the world's fastest growing economy, Jakarta holds a strategic role in Indonesia urban system. However, the city has been constantly dealing with flood since the colonial era. The underlying factors of Jakarta's vulnerability to flood can be attributed to geographical conditions, infrastructure quality, environmental damage and partly to lack of people awareness to disaster. Around 40% or 24,000 ha of Jakarta area were located under the sea surface and they have been constantly pressured by the uncontrolled urban growth and lack of enforcement of groundwater extraction. In February 2007, floods accounted for over than IDR 5.16 Trillion of lost and damage and projected to increase to IDR 6.3 Trillion in 2013 (BPBD Provinsi DKI Jakarta, 2012).

The World Bank/GFDRR with AIFDR, HOT and BNPB worked to support BPBD Jakarta in strengthening risk information urban flood management. The initiative was triggered by the launch of InaSAFE -

application to produce contingency plans of various hazard impact scenarios. The only challenge was Jakarta had only administrative boundary up to kelurahan (village) levels which had lead InaSAFE generates an overestimated flood impacts. Greater detailed information on boundaries and assets was crucial for risk assessment. It was then responded by encouraging public participation through OpenStreetMap-a free mapping crowd source platform.

In 2012, the World Bank supported BPBD DKI Jakarta to piooneer mapping 2,688 sub-villages (RW), 6,000 of buildings/assets in 267 villages in Jakarta. Thereafter the city received support of mapping sub-sub district for area indicated as highly risk to frequent flood, enabling the city estimated impact in more localized way and promised better preparedness to flood.



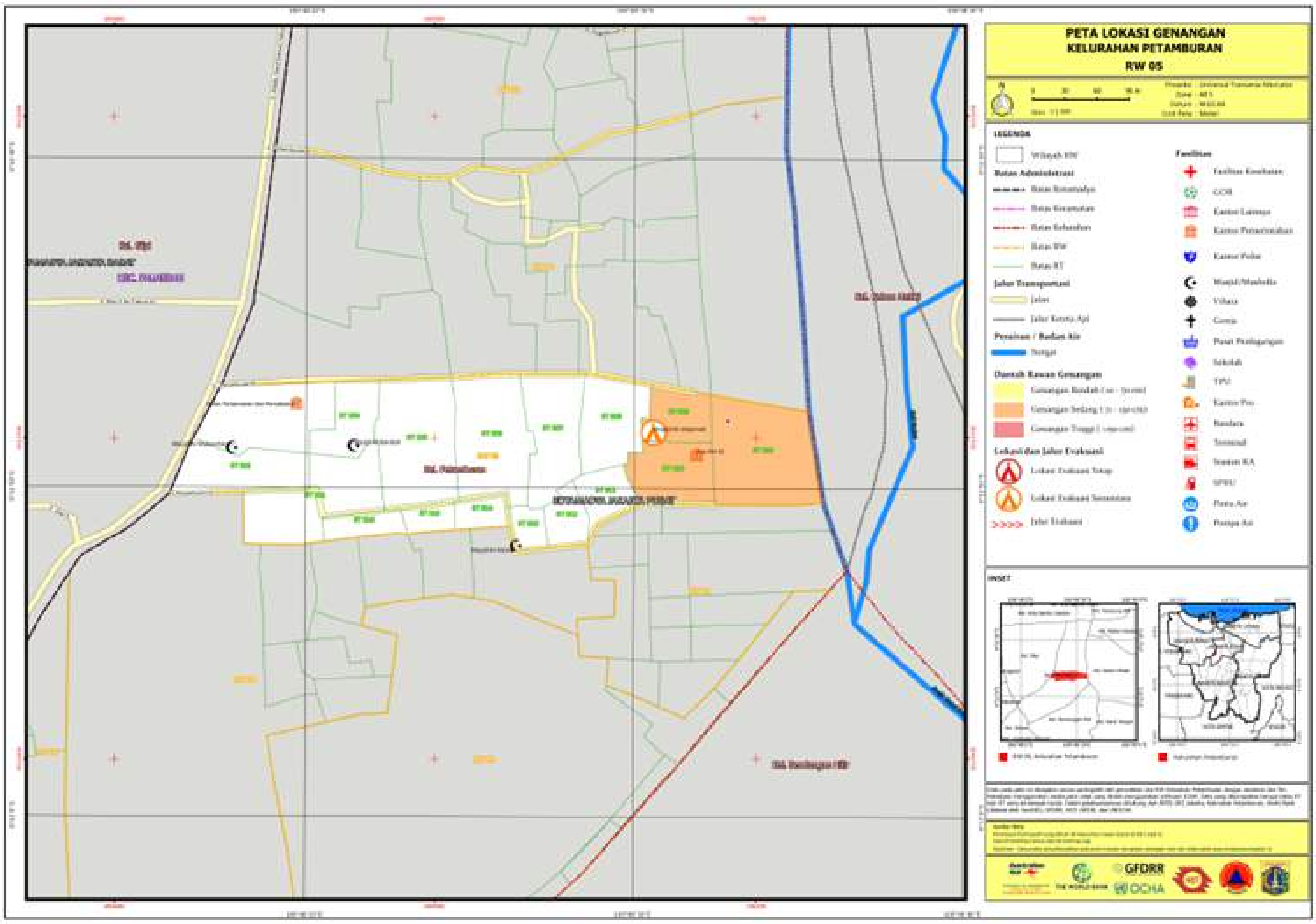


Figure 5.2. Inundated area in one sub-village in Jakarta as generated from field reports

The data of detailed boundaries and assets exposure allows Jakarta to model damage and loss calculation instantly following a flood event. The Bank supported the development of Jakarta DALA System Calculator named by JakSAFE. By overlaying hazard with exposed assets as reported from the field the system able to estimate financial damage and losses due to flood in no time. In the late 2015, the JakSAFE becomes part of Jakarta Smart City system.

5.2 Enabling Capacity: Integrated water resource management planning in Balikpapan

High-scale mapping of disaster prone area is one of the options can be done in building capacity. Traditional data and information management, where data are managed sectorally, is not effective since it creates a geospatial information gap in decision-making, implementation and monitoring. By doing a high-scale mapping, this problem hopefully can be solved by accumulating spatial data of disaster vulnerabilities.

The example of a high-scale mapping implementation can be found in Yogyakarta and Balikpapan. Both Yogyakarta and Balikpapan are categorized as big cities; both local governments chose river are as mapping location, which are Winongo River in Yogyakarta and Ampal River in Balikpapan. Both locations are prone to flood risk and landslide. Both have a relatively similar percentage of poor people, which is 4%, and the location is the based of World Bank study about city profiles (Gunawan et al, 2015).

In Balikpapan, Bappeda acted as the main coordinator, supported by Balikpapan University, who acted as technical consultation and some local public figures. Community participation emphasizes on borders validation and acquirement of disaster history data; both data are synchronized into the map resulting in disaster thematic information. The data enables detailed disaster risk spatial plans which focuses on disaster mitigation and settlement planning.

The data and information provided from City Risk Diagnostics and Collaborative Mapping enables the city performs urban spatial planning that taken into account to risk of river flood and sea level rise. It allows for implementation of integrated water resource management concept that emphasizing development for each region. For instance, the upstream would be focused on water conservation to restore and increase catchment. The midstream was planned to provide more space for settlements and increase its quality by improving drainage system and normalize riverway, this include resettlement plan for slums by the river. The downstream area was to adopt reclamation that adhere green construction principles as suggested in the City Risk Diagnostics.

Figure 5.3 an artwork pictures the downstream built environment of Balikpapan
Source: Gunawan et al 2015

In short, there at least three stages of building urban resilience were covered, which are building capacity in providing accurate information, resolving uncertainty and enhancing disaster risk understand. In this urban helix phase, it is included in the second step of risk assessment follow-up which was recommended as priority in urban development corridor. The next step is to formulate structural and non-structural measures needed in urban development planning to mitigate risk. Overall, the collaborative risk assessment should be considered as disaster mitigation strategy, which should be internalized into decision-making system on city level to achieve sustainable development goals.

5.2. Mi 5.3 Urban Resilience Measures: Urban Upgrading in Karang Waru & JUMFP tigasi Struktural Penanganan Banjir

Urban Upgrading

Structural Mitigation

Collaborative approach for urban upgrading di Karangwaru Sub-district and Bener Sub-district, Yogyakarta Special Area (DIY)

In Yogyakarta, Karangwaru neighborhood is vulnerable to flood and landslide along Kali Buntung River. The neighborhood was polluting the river by discharging solid waste and human waste into the river. Due to its condition, the neighborhood was targeted as one of urban development priority program in 2009.

The program was known as Neighborhood Development (ND) program and aimed to alleviate poverty under the PNPM program for Human Settlement which led by Ministry of Public Work Directorate. The specific challenge of the program was to minimize the possible social conflict that might have arisen from rearranging of settlement in the riverside. The slum rearrangement aimed to reduce flood risk, which was achieved through river revitalization, waterfront neighborhood, infrastructure enhancement (wall river strengthening), forestation, fencing and river walk built at both river sides.

The program is done in several stages. At the first stages, to ensure the people's participation in the spatial rearrangement planning, the people were shown some of the designs. As soon as some of the settlers were willing to release their land, the rearrangement started by moving their houses 1.5 meter away from the river side.

ND supports the financing for one segment of the river, while the input of planning resulted from people is included in the mid-term city development planning (RPJMD) in 2013. The detailed engineering design is made by an architect team from local university (UGM).

Figure 5.4 Environmental Issues Mapping in Bener Neighborhood, Yogyakarta

In 2013, to overcome the problem volunteers provided a technical assistance for upgrading the neighborhood, which known as the Riverfront Redevelopment Design Plan. The program aimed at integrating economy-based environmental program with the development of riverbank areas that promote the public welfare and social equity, while significantly reducing disaster and climate risks.

The first stage of the program was facilitating the communities to identify the potential local resources and make the economic-environmental-based riverbank development plan in the study areas. Primary and secondary data were collected from a variety of relevant sources. The next stage was facilitating coordination among various stakeholders such as governments, universities, and private sector in the study areas in to be involved in the development plan process.

The coordination of development plan resulted in recommendations such as: (1) to utilize existing well as water source, (2) training and shaping of waste management groups, and (3) building a temporary dumpster. From the local community perspective, several inputs were added, which were renovation of uninhabitable houses, making of water hydrant and fire extinguishers, and fixing

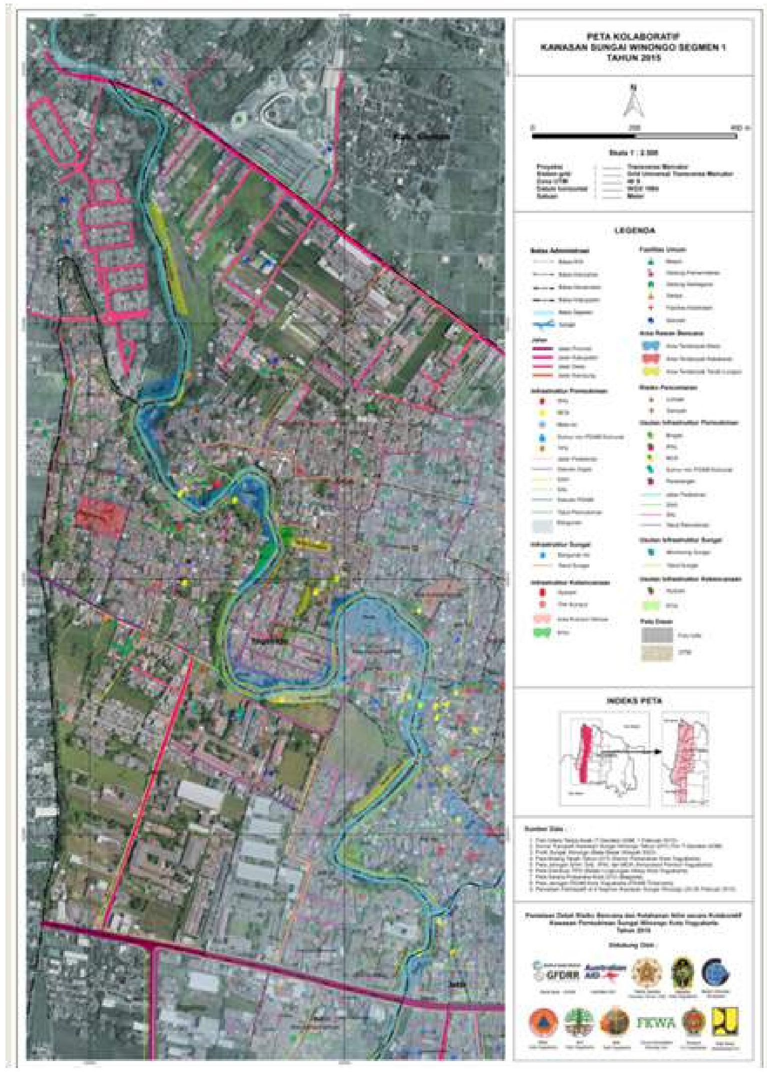


Figure 5.5 Thematic map illustrating segment of Bener Neighborhood in 1:2000 of scale

broken water embankment.

Business development plan was developed by community participation approach to make a Kampung Wisata (Tourism Village) for outbound activities in water-based ecosystem and traditional Javanese children games. The initiative then followed up with hazard microzoning and pre-feasibility study (Fig. 5.4). The hazard microzoning included three key features of the areas, namely (i) geographical, socio-economical and structural profiles of the area such as land use parcels and static (ie. settlements, commerce, public utilities, open space, etc); (ii) key assets and basic infrastructures, and (iii) natural features (i.e. river, swamp, bushes, etc). This process was done to find local solutions to reduce disaster and climate risk. One output of the hazard microzoning was identifying structures that located within hazard zones, and also available land parcels for in situ location.

The hazard microzoning and the pre-feasibility study identified several structural measures and environment revitalization that will help increase the sub-district resiliency. This multi-discipline analysis, involving a diverse group of experts from economists, environmentalist, hydrologists, and community development specialists, legal advocated as well as community representatives. With the help experts and planners, the community and the government can manifest their vision of the river walk development.

Structural Mitigation Flood Management in Jakarta under Jakarta Urgent Flood Mitigation Project (JUFMP)

Forty percent (40%) of Jakarta is lowland areas and has average altitude below the sea surface. In addition to the high rainfall, Jakarta is also a downstream of fourteen rivers, making the city highly vulnerable to flood. In addition, many of Jakarta's drainage are clogged; the high level of deforestation also contributed to the flood vulnerability.

Jakarta has a history of 5-year-flood, but the year gap gets narrower from 2007 to 2013. In 2013 the flood causes 6.36 trillion IDR loss (BPBD DKI Jakarta), from public facilities damage, transportation disruption, energy and the stopping of activities in business and office centers. One of the efforts by Jakarta Government in reducing flood risk is to add more capacity in water reservoir also adding and maintaining waterworks facilities such as lake, reservoir, and river normalization

Figure 5.6 JUFMP Working Scope

and dredging. Jakarta Urgent Flood Mitgation Project (JUFMP) is an example of large scale structural mitigation. It aims at contributing to the improvement of the operation and maintenance of priority sections of Jakarta's flood management system. There are two components to the project. The first component is dredging and rehabilitation of selected key floodways, canals and retention basins. This component supports the dredging and rehabilitation of 11 floodways / canals and four retention basins which have been identified as priority sections of the Jakarta flood management system in need of urgent rehabilitation and improvement in flow capacities. The dredge material is transported and disposed into proper disposal sites. The second component is technical assistance for project management, social safeguards, and capacity building. This project is implemented by Public Works Ministry and Jakarta Local Government from May 2012 - March 2017.

5.4 Risk Infusion Practices

Governance, Regulation and Institution

The government of Indonesia has been working on improving the quality of national development by creating a guideline of DRR policy that put emphasis particularly for urban areas. In a study of Indonesian Disaster Risk Index (IRBI) in 2013, the National Disaster Management Agency (BNPB) identified and mapped all the cities and districts with high disaster risk. The results of the mapping formalized into the National Medium

Term of Development Planning (RPJMN) 2015-2019 which was then translated into subsequent policies and action strategy of BNPB. The GoI targets to reduce the disaster risk index by 30% in 136 cities and districts identified as having priority or high risk by 2019.

This effort requires BNPB to collaborate closely with related institutions in charge. For example, the program Safe School that required facilitation of of the World Bank and active collaboration between BNPB and the Ministry of Education and Culture. One of the outputs of this collaboration is a guideline for structural reinforcement of school buildings in landslide prone areas, which has been implemented in several elementary schools in West Java.

Another program is the National Slum Upgrading Program which was done under collaboration between BNPB and the Ministry of Public Works and Housing which targets to organize the slum areas in 20 cities in Indonesia. The program was designed to improve the city resilience through reducing the vulnerability of the poor people. Until this paper is written, the World Bank is assisting the municipalities to redesign the slum area with DRR based approach by providing a high resolution of GIS map of the respective slum areas. It is expected that through this program the municipalities are able to develop the necessary measures of urban upgrading program that is based on the principles of DRR in slum areas.

From the above examples, it is obvious that collaboration among institutions, that translated into implementation across sectoral, is a key factor in achieving the GoI's target to reduce disaster risk index, which eventually help to create resilient cities in Indonesia.

5.4 Risk Infusion Practices

Finally the some of the highlights from key lessons to urban resilience are as follows:

- Mainstreaming resilience concept into urban development should be first done towards the policies and regulation that would govern the subsequent steps, be it action plan, financial budgeting, spatial planning or implementation programs. Once resilience principles have been embedded into the law and regulations, resilience principles can be enforced or at least encouraged in the urban development programs.
- To increase resilience, urban development should aim its priority towards the most vulnerable group that could be easily found in slum area. For example is the slum upgrading program in Yogyakarta, which aimed to construct embankments along the river in Karang Waru that is mainly inhabited by poor people. Through this program, the local community had healthier living environment and was protected from flood risk.
- Coastal cities should put extra effort in increasing the urban resilience, particularly due to their vulnerability towards sea level rise, in addition to other disasters such as flood and tsunami.
- Community participation is crucial is assuring not only the success of any program but also the sustainability of the program; in addition, community participation put the involved stakeholders in the same perspective and increase the community capacity and preparedness (e.g Kampung Siaga Bencana program)
- Integrating risk financing in order to achieve more robust DRR and CCA program and efficient budgeting; this could be done by coordinating program across institutional agencies in the government or even involving the potential private sectors.

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Technical Note 6

Lessons from the Efforts to Develop Disaster Risk Financing and Insurance Framework in Indonesia

THE WORLD BANK
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GFDRR
Global Facility for Disaster Reduction and Recovery

Content

1. Economic Impact of Disasters in Indonesia

Indonesia is located in an area with a high risk to several types of disasters. According to EMDAT CRED ranking on six types of natural disasters (Table 1), Indonesia ranked first on two natural disasters: tsunami and landslide. Of the 76 countries, Indonesia ranked the first for tsunami risk with more than 5 million people exposed, while for landslide it ranked first from 162 countries with more than 195,000 people exposed.

According to the World Bank's 2005 publication entitled "Natural Disaster Hotspots- a global risk analysis", Indonesia ranked 12th of 35 countries with high disaster risk in which more than 40 percent of the population had a high risk of exposure to disasters.

Within a ten-year period (2004-2014), Indonesia was hit by various major disasters causing damage and losses. One of the tsunamis occured in Indonesia which has caused major damage and casualties was the tsunami in Aceh and Nias on the 26th December of 2004 with 110,229 people died, 12,132 missing and 703,518 people were displaced and a loss of US$ 4.5 billion, equivalent to Rp 41,400 trillion. Likewise, the Earthquake in DIY-Central Java which occurred in May 2006 caused major damage and losses amounted to Rp 29,100 trillion. Other disasters also followed such as the Earthquake in West Sumatra (September 2009), the Earthquake in Tasik Malaya (September 2009), and the Flood in Wasior, the Earthquake and Tsunami in Mentawa Islands and the Eruption of Mount Merapi in October 2010 (Table 2).

Empirical studies show that in the aftermath of a major natural disaster, it will usually be followed by:

- Slowing economic growth
- An increase on budget deficit
- An increase on inflation
- A decrease on interest rates
- An increase on foreign loans

Economically, the impact of earthquake and tsunami in Aceh and Nias was relatively small with only 0.3% of national GDP (Gross Domestic Product) but it was very significant at regional level with approximately 45% of the RGDP (Regional GDP) of Aceh. Similarly, the Earthquake in Yogyakarta in 2006 was amounted to 41% of its RGDP and the Earthquake in West Sumatra in 2009 was amounted to 30% of its RGDP. Moreover, the disasters in early 2014 caused an inflation of 1.07%, higher than in January 2013 of 1.03%.

Hazard type	Population exposed	Percentage of population (0 5 10 20 40)	Country ranking
Cyclone	1.636		67th out of 89
Drought	2.029.350		36th out of 184
Flood	1.101.507		6th out of 162
Landslide	197.372		1st out of 162
Earthquake	11.056.806		3rd out of 153
Tsunami	5.402.239		1st out of 76

The total damage and losses of disaster

Kerugian	**41400 Milyar**	**29150 Milyar**	**3,92 Milyar**	**7300 Milyar**
Jenis Kejadian	Gempa bumi dan Tsunami Aceh	Gempa bumi DIY & Jawa Tengah	Gempa Nias	Luapan Lumpur Sidoarjo
Waktu Kejadian	Juni 2004	Mei 2006	Maret 2005	Mei 2006




34000 Milyar	**3628,7 Milyar**	**348,9 Milyar**
Bencana lain-nya	Erupsi Gunung Merapi	Gempabumi dan Tsunami di Men-tawai
2004-2010	Okt 2010	Okt 2010



8340 Milyar	**1356,6 Milyar**	**865 Milyar**
Banjir Jabodetabek	Gempabumi aceh dan Bener Meriah	Letusan Gunung Sinabung
Jan 2013	Jul-2013	Jan-2014




events in Indonesia (2004-2014)

5184 Milyar

Banjir Jabodetabek

Feb 2007

1080,7 Milyar

Gempabumi Sumatera Barat

Mei 2007

1790,9 Milyar

Gempabumi Bengkulu dan Sumatera Barat

Sep 2007

280,16 Milyar

Banjir Bandang di Wasior, Papua Barat

Sep 2010

21.600 Milyar

Gempabumi di Tasikmalaya, Jawa Barat

Sep 2009

1691,5 Milyar

Banjir dan Tanah Longsor - Jawa Timur

Feb 2007

1255 Milyar

Letusan Gunung Kelud

Jan 2014

20 Milyar

Kebakaran Hutan dan Lahan

Mar 2014

221000 Milyar

Kebakaran Hutan dan Lahan

Feb-Mar 2015

Total Kerugian : 381.865,28 Milyar

2

2. Challenges in Financing Post Disasters

According to the Law No. 24 of 2007 on disaster management, National, Sub-national governments and the community share the responsibility in managing disasters. Government of the affected areas would be the leading party in charge of disaster response starting from the phase of preparedness, emergency response and post-disaster recovery, rehabilitation and reconstruction.

At the phase of post-disaster rehabilitation and reconstruction, it is stated in the Government Regulation No. 21/2008 on the Implementation of Disaster Management, that if a Regency/City has no adequate budget, then the it may request the assistance of the Provincial Government and if the Provincial Government is also not capable, then the request can be submitted to the National Government through the National Disaster Management Authority (BNPB).

Disaster management funding is stipulated in the Government Regulation No. 22/2008 on Financing and Management of Disaster Assistance. There is a term of "social assistance in form of grants" in this Government Regulation which is a fund provided by the Government to the local government as an aid for post-disaster reconstruction. This fund comes from the State Budget (APBN), particularly from the disaster management budget for activities during emergency response and post-disaster phases. The disaster management budget is currently managed by the National Disaster Management Authority (BNPB) as the Authorized Budget User (KPA) while the Ministry of Finance as the Budget User (PA), because the Reserved Fund for Disaster is included in the account of State General Treasury (BUN) for Other Expenditures (code 999.08).

The challenge related to post-disaster recovery financing through social social assistance in form of grants is a delay on delivery between the event of disaster and the receipt of disaster rehabilitation and reconstruction fund in the afected areas. In a workshop organized by BNPB in collaboration with the World Bank on 15-16 April 2015 on 'Opportunities to strengthen DRFI 2015-2020', Dody Ruswandy as the Secretary General of BNPB stated that: "Experience in the last 5 years showed that there were problems in funding the Rehabilitation and Reconstruction (RR) phase. It is in contrast to the emergency response fund with its On-Call Fund which has already had clear and adequate budget mechanisms and processes. As for the post disaster phase, some obstacles still remain, namely:

a) There is no sufficient and specific funding for Rehabilitation and Reconstruction;
b) There is no an overall policy framework for Rehabilitation and Reconstruction;
c) There is still lack of clarity in its implementation mechanism".

The availability of Disaster Reserve Fund from BUN (State Treasury) 999-08 account especially for the Social Assistance Fund in form of Grant has been experiencing problems since 2012. This affected the post-disaster recovery as experienced by Mando which was hit by flash flood in January 2014 only to receive funding in mid 2015 or one and a half years after the disaster. The delay can also be attributed to the audit findings of the Supreme Audit Agency (BPK) that the nomenclature in the Government Regulation 22/2008 needs to be revised as the term "Social Assistance in the form of Grant" is not recorgnized in the

State financial mechanism. However, GR revision process is not easy and requires a long time to be implemented while on the other hand, the post-disaster recovery cannot be delayed.

The short-term solution proposed by the Ministry of Finance to accelerate the disbursement of Disaster Reserve Fund to be used for the Rehabilitation and Reconstruction process was by preparing a Minister of Finance Regulation (PMK) 162/2015 on Grant from the National Government to Local Governments as Assistance for Post-Disaster Rehabilitation and Reconstruction. The legal basis for issuing this PMK was the Government Regulation 2/2012 on Regional Grants, and the State Budget Law Year 2015 article 16 paragraph 2 which stated that the Government may provide grants to local governments in the context of post-disaster rehabilitation and reconstruction.

Despite the issuance of the PMK, there remain issues of time lag and multi-years allocation for rehabilitation and reconstruction. The time lag problem that has been experienced so far was one year if the event of disaster occurs at the end of the fiscal year, in which the state budget has already been made and fund budgeting for the rehabilitation and reconstruction can only be allocated in the following year.

Another challenge related to financing post-disaster rehabilitation and reconstruction fund is about the financial responsibility of the sub-national governments. Although Law No. 23 year 2014 on Regional Government has stipulated that disaster management is also among the mandatory responsibilities of provincial and local governments, in practice local budgets are still not made available. As Law No. 24 of 2007, clearly stated that disaster management is a common responsibility among **government, local government, and the society,** the role of local (government and society) needs to be made mandatory in contributing to financing post-disaster recovery through some sort of cost sharing methods.

Box 1. Multi-Year Funding Challenge

Problems related to multi years occur during the usage of the fund for rehabilitation and reconstruction as the usage cannot extend the relevant fiscal year so that its execution must be halted. Even if it can be extended by 2 years as set in BPNB Regulation No. 14 year 2011 on Technical Guidance on the procedure for filing and managing Social Aid Fund in form of grant for Post-Disaster Rehabilitation and Reconstruction year 2011 and the Regulation of Director General of Treasury, Ministry of Finance No. Per-63/Pb/2011 dated on 29 September 2011 on the Procedure of Post-Disaster Reconstruction and Rehabilitation Fund Disbursement year 2011. Nonetheless, the implementation still experienced a delay in its completion, as was the case with the rehabilitation and reconstruction after the 2010 earthquake in Mentawai Islands which had to refund as much as Rp. 383 billion to the State Treasury in 2013 of the total received fund amounted to Rp 486.4 billion.

This also happened to the eruption of Merapi in 2010, Yogyakarta Province and Sleman Regency respectively had to refund Rp 15 billion of the total fund received amounting to Rp 110 billion and Rp 72.67 billion of total received fund amounted to Rp 189 billion, and the Flood in Wasior had to refund as much as Rp 42 billion of Rp 83 billion received fund.

3

3. Indonesia's Disaster Risk Financing and Insurance Framework

As a country prone to natural disasters, Indonesia is heading toward the implementation of disaster risk financing mechanism that embraces the concept of risk layering with diverse financing sources (Figure 1).

Currently, the disaster financing in Indonesia is still handled case by case and not as a Portfolio and has yet to be integrated as a mosaic of instruments as illustrated in Figure 2. Disaster

management financing still relies entirely on State fund allocation through the Reserved Fund (999-08), which is actually only suitable for managing a small-scale recurrent disasters. In order to finance post-disaster recovery in achieving targeted goals, some of the followings need to be considered as requirements:

1. The funds shall be available in a timely manner and it is still usable after the fiscal year;
2. There shall be a firm and clear division of responsibilities for financing the rehabilitation and reconstruction based on teh oenwrship of the assets (i.e., aseet owner holds the primary financial responsibility); and
3. There shall be diversification of funding sources for financing post disaster recovery.

International experiences from the countries that have high levels of economic development and disaster risk profiles similar to Indonesia today (such as Mexico, Columbia and Turkey) show that disaster risk financing which only relies on State budget allocation is no longer sufficient. Acceleration in developing infrastructure by itself will increase and create new risks. Therefore, it is the time for Indonesia to implement Risk Layering concept as part of DRFI Framework.

Initial studies conducted by Ministry of Finance, BNPB and the World Bank in 2011 estimated that to deal with medium and large-scale disasters, the Government would require access to financing of approximately US$ 1.6 billion (Rp 20 trillion) to meet the needs of post-disaster recovery. Initial estimation shows that the amount could provide protection against events with a cycle of 100 years.

Various efforts have been undertaken in studying feasibility and selection of financing and insurance schemes for disaster management, but the implementation is still very limited to some areas only and generally still relies on conventional budgeting system. The case of flood in 2014 occured in Manado, that has been flooded again this year and has not been addressed, is an example that during the past 5 years we still have not made meaningful progress in implementing this framework.

4. Implementation Status of DRFI Framework in Indonesia

DRFI management must cover all existing instruments as depicted in the mosaic above as-a-whole rather than as stand-alone instruments. For the entire mosaic to work it cannot be separated from the efforts to make the fund available for post-disaster rehabilitation and reconstruction quickly and in a timely manner. The nature of post-disaster recovery that typically requires more than one year means that it is necessary for the fund to be able to be carried forward to the following year.

At the time of this Technical Note preparation, the various risk financing instruments in the mosaic were still at different stages of implementation in that they have not provide a 'universal' coverage to all assets that may be affected by disasters. However, some notable progress have been made including:

a. On-Call Fund ('disaster reserve'):

- BNPB had implemented On-Call Fund (DSP) mechanism which can be disbursed and distributed fast at the time of emergency response. This mechanism has been running well for emergency response phase. However, efforts to expand the scope to the post-disaster recovery phase still causes concerns on the management side of budgeting/ finance and nomenclature.
- Based on the Budget Law No. 3/2015 Article 16 and PP 2/2012 on Regional Grants, Regulation of the Minister of Finance No. 162 year 2015 concerning Grants from Central Government to Local Government in the Framework of Financial Assistance for Post-disaster Rehabilitation and Reconstruction was enacted in August 2015. This has provided a legal basis for providing grant to local governments for post disaster reconstruction. But detailed mechanisms for managing the reconstruction activities funded by the grants are yet to be fully developed.
- The government has also had an Emergency Fund regulatory system by means of PP 44/2012 designed for the situation of a national level disaster. However, its substances can be used in preparing the legal framework governing the disaster funding mechanism at provincial and regency/city levels.

b. Fiscal Protection Insurance:

- The Directorate General for Financial Risk and Funding Management has developed an insurance scheme and estimating premium for fiscal protection based on earthquake risk modelling that has already existed for the country.
- Draft Finance Minister Regulation (PMK) for this scheme has been prepared but not yet ratified.
- Budget for the premium payment has been proposed in the Budget Year of 2015, but eventually the scheme was not implemented.

c. Funding Pooling (BLU/Public Service Unit):

- The Directorate General of Budget has conducted a study on the feasibility of establishing a pooling mechanism for managing allocated disaster funds that can be drawn in the event of consecutive disasters. The primary consideration was that many relatively small but frequent disasters typically would not trigger the insurance which remains to be handled by means of funding from the State Budget.

- DPR (House of Representatives) usually approve RR fund on the basis of the Action Plan prepared by BNPB, but experience showed that the implementation was always more than one budget year.
- Pool establishment can solve this problem and could learn from the experience of the Education Endowment Fund (LPDP) establishment, which also has a post-disaster rehabilitation mandate for the education sector.

d. Insurance of National Assets:

- The Directorate General for State Assets has prepared Government Regulation 27/2014 on Government Assets, which will include acrticle on assets protection insurance.
- Public assets was estimated at around Rp 1,900 trillion, with initial premium value calculation of Rp 1.1 T per year (rate of 0.068%).
- This program can be managed by a public service unit (BLU – which could be the same BLU with that for the fund pooling), and a PMK draft was being prepared.

e. Local Government Assets Insurance:

- The Ministry of Home Affairs had issued a Regulation of the Ministry of Home Affairs that had been relied upon by regions in allocating budgets to insure local assets. The procurement prosess uses a procurement mechanism for standard services which are not suitable for financial services.
- This program can be synchronized with the central assets insurance so that there will be a synergy between the State Financial Law and the Regional Government (Financial) Law.

f. Public Assets Insurance:

- Financial Services Authority (OJK) has a regulatory well as advocacy mandate. On the advocacy side, a wide range of micro-insurance products have been introduced, including for emergency conditions.
- OJK was studying the feasibility of implementing traffic accident insurance scheme as a model for disaster insurance.
- Traffic accident insurance has universal coverage, based on contributions drawn through various means (vehicle registration renewal, transport ticket prices, etc), and also provided benefits in form of basic compensation.
- It is possible to apply the same scheme to public assets insurance by using electricity or property tax payment for premium collection.

g. Private Assets Insurance:

- Private assets insurance has been driven by market forces, but its penetration needed to be further enhanced using government policy supports.

5. Viable Policy Options

Given the above progress in advancing the policy and regulatory discourse in aligning the various DRFI instruments to form a mosaic/framework that will cover the financing needs of different asset ownership, Indonesia is actually on the right path toward a comprehensive framework for DRFI implementation. There are several concrete actions that could be further implemented to strengthen DRFI in Indonesia, including:

1. Preparing risk profiles based on various perils and regions in Indonesia that will serve as the basis for developing fiscal strategy and developing market for risk transfers. Such profiles can initially be focused on major perils such as earthquake and tsunami and floods.
2. Clarifying the division of financial responsibilities and contingent liability for rehabilitation and reconstruction among the stakeholders, either the central government, local government, public or private parties based on the ownership of assets that may be impacted by the disasters. Codfying this policy through amending explicit articles into key existing government regulations on disaster management, public finance, and regional governance.
3. Operationalising several key instruments by establishing or designating institution(s) and formulating implementation procedures for:

    a. Disaster Reserved Fund that uses budgetary vehicle in the form of Public Service Unit (BLU) with specific mandate to manage Rehabilitation and Reconstruction fund allocation which has already been approved by the Parliament until the completion of the recovery program using such funds. The DRFI BLU can serve as both fund manager, pool, and insurance agent of the Government.
    b. Budget allocation coordination by the Ministry of Finance (e.g., Directorate General for Financial Risk and Funding Management) and BNPB to ensure that sufficient funding and/or insurance coverage are provided in accordance with the ownership of the assets.
    c. Implementing scheme and standard procurement for Insurance of Central Government Assets (BMN) and Local Government Assets (BMD) including clear legal certainty that premium payment will notbe considered as state losss in the event that a disaster occur but payout is not trigerred.
    d. Improving the existing regulations on the provision of grant from National Government to sub-national governments and community using transfer mechanisms and budget lines that would ensure timely availability of the RR funds and shared responsibilities and accountability between different level of governments.
    e. Gradually expand the mandate and tasks of the DRFI BLU to diversify its financial sources beyond the state budget contribution to include combination of risk transfers (insurance and catastrophe bonds), and regional fund pooling.

6

6. Key Lessons

- DRFI is a complex and multi-faceted and cross-sectoral subject that no single government agency could manage the entire spectrum.
- In order for the DRFI to work as a framework joint leadership is required comprising at least of the BNPB, Ministry of Finance (involving various directorates general), and Ministry of Home Affairs.
- Clear budgetary responsibilities and processes for post disaster reconstruction is a must before more sophisticated instruments such as insurance, catastrophe bonds, stand-by credit and others could be useful.
- Budgetary vehicle in the form of a BLU provides viable options to ensure that a combination of different financing instruments still falls within the State Finance Law mechanism.

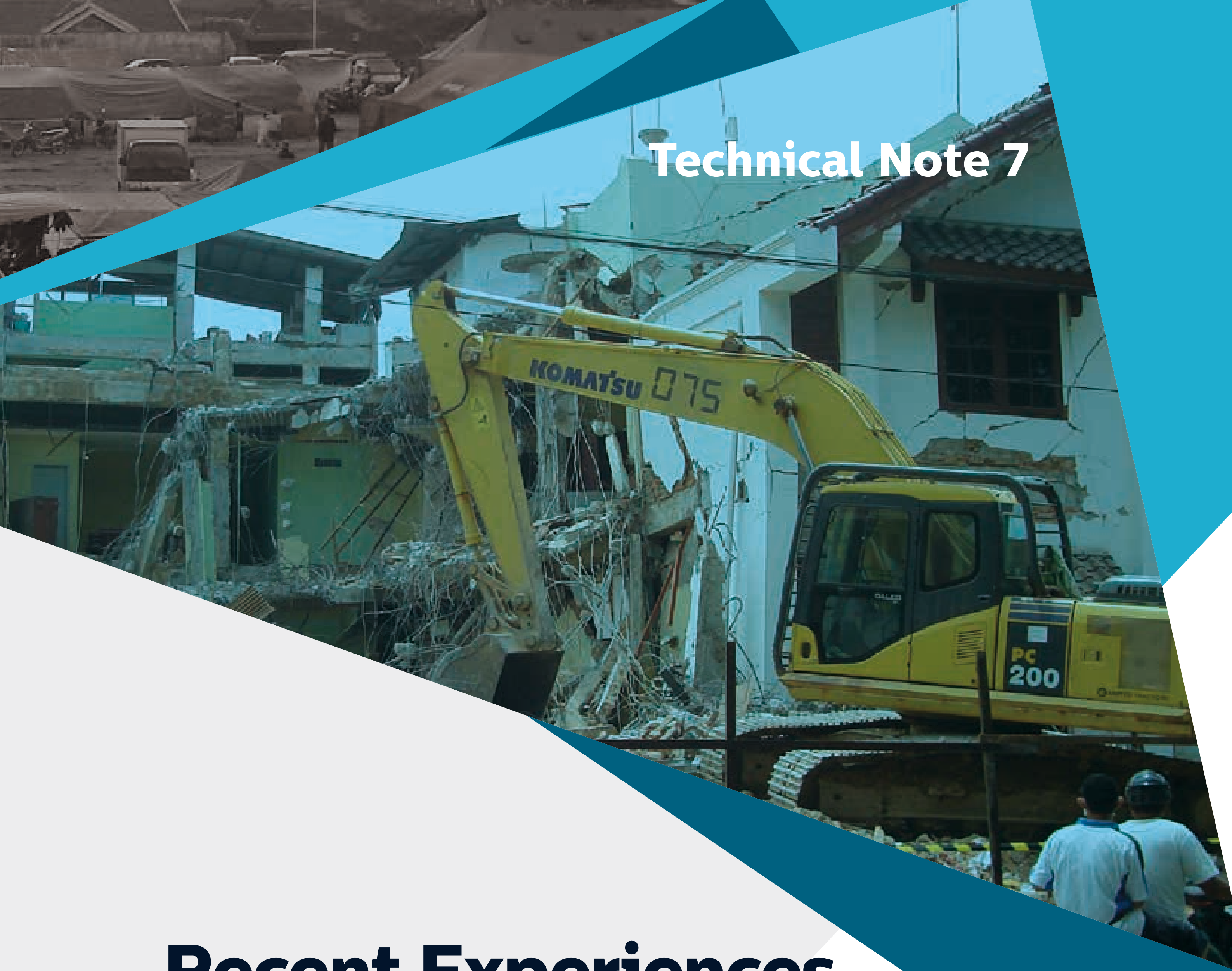
GFDRR

Global Facility for Disaster Reduction and Recovery

www.gfdrr.org

The Global Facility for Disaster Reduction and Recovery (GFDRR) is a global partnership that helps developing countries better understand and reduce their vulnerabilities to natural hazards and adapt to climate change. Working with over 400 local, national, regional, and international partners, GFDRR provides grant financing, technical assistance, training and knowledge sharing activities to mainstream disaster and climate risk management in policies and strategies. Managed by the World Bank, GFDRR is supported by 34 countries and 9 international organizations.

Technical Note 7



Recent Experiences in Resettlement for Disaster Prevention and Recovery in Indonesia

WORLD BANK GROUP

GFDRR
Global Facility for Disaster Reduction and Recovery

Content

Chapter 1 INTRODUCTION

Typology of Disaster Impacts in Yogyakarta and Central Java

Overview

Indonesia is one of the most disaster-prone countries in the world. The Indonesian archipelago - recognized to be one of the largest in the world - has more than 13,000 islands out of which 6,000 are inhabited. Situated on the Pacific Ring of Fire and at the meeting of the active Indo-Australian plate in the South, the Eurasian plate in the North and the Pacific plate in the East, the country is highly exposed to numerous different hazards and vulnerabilities and have differing levels of disaster response capacity and ability to manage the consequences of crises[1].

INDONESIA FACT SHEET

13,466 islands
largest archipelago in the world

34 Provinces
416 Districts
98 municipalities
7,024 sub-districts
81,626 villages/urban villages

81,000 KM coastline
2nd longest in the world

237 million people
4th most populated in the world

MEGA BIODIVERSITY
10% plants, 12% of mammals,
16% of reptiles, 15% fish,
17% of bird
in the world live in Indonesia
3rd largest in the world

129 active volcanoes
1st in the world

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[1] USAID (2014) Indonesia: Disaster Response and Risk Reduction, USAID'S Office of U.S. Foreign Disaster Assistance (USAID/OFDA), 24 October 2014, available at https://www.usaid.gov/sites/default/files/documents/1866/FactSheet_Indonesia_DRRR_2014.pdf

History of the Formation of Merapi Volcano

Stratigraphic research shows that the history of Merapi Volcano formation is very complex. Wirakusumah (1989) divided the geology of Merapi into two big groups, i.e. Young Merapi and Old Merapi. Further research (Berthomier, 1990; Newhall & Bronto, 1995; Newhall et.al, 2000) found more detailed stratigraphic units of Merapi. According to Berthommier (1990), based on stratigraphic analysis, Merapi's history can be grouped into four stages:

From the chronology, it can be seen that the increase in volcanic activities of Mount Merapi in 2010 occurred very rapidly that the Center for Volcanology and Geological Hazard Mitigation changed the status of Mount Merapi from Normal to Beware in less than one week; something uncommon with the previous eruption events.

ADD GRAPH

History of Merapi infographics

Merapi Eruption and its Impacts

In the middle of post-2006 earthquake recovery, in the last quarter of 2010, particularly on 26 October 2010, Merapi volcano erupted and afflicted damages to communities in Central Java and the Special Region of Yogyakarta. Around 61,154 people were displaced, 341 died, and 368 injured and needed hospitalization due to the eruption. Pyroclastic flow and fallen materials damaged 3,307 houses, schools, community health centers, and markets.

According to the Head of District Decree on Prohibited Zones in Mount Merapi areas, during the Beware status, people were not allowed to conduct activities in these areas. The local people were then evacuated to evacuation shelters or areas that were considered safe as recommended by the Geology Agency of the Ministry of Energy and Mineral Resources. Since 26 October - 4 November 2010, Merapi continued to produce pyroclastic flows and lahar; expanding the danger zone to 10 km from the top of the mountain. Displaced people were concentrated in several points in four districts in the two province, i.e. the Special Region of Yogyakarta and Central Java.

Merapi eruption on 25 November 2010 was a 100-year cycle that was characterized by big eruption with pyroclastic flow reaching up to 18 km through Gendol River. The 2010 hazard event was beyond the capacity of the local communities in understanding the characteristics and symptoms of pyroclastic flows. Pyroclastic flows even reached a radius beyond the defined pyroclastic flows hazard areas, which include areas within 7-10 km from the eruption center.

ADD GRAPH

Locations and Number of Displaced People

Chronology of 2010 Merapi Eruption

Mount Merapi has long exhibited a phenomenal eruption that attract the attention of people not only from Yogyakarta and Central Java, but also from the national level. Since September 2010 people's attention was directed again to the volcano, due to the abnormal activities demonstrated by Merapi. The natural processes that happened within the volcano started to resurface, starting from smoke expulsion, pyroclastic flows and finally big eruption that was followed by lahar flood.

Sleman District Government has long conducted close monitoring of Merapi situation, so any development that may indicate potential eruption is well monitored. The following section presents the chronology of events that lead to Mount Merapi eruption, based on the data and records from the Center for Volcanology and Geological Hazard Mitigation Yogyakarta.

ADD GRAPH

Above: Timeline chronology of 2010 Merapi eruption. Below: Impacts of 2010 Merapi Eruption

Lahar Flooding: Merapi Volcano's Secondary Hazard

On 5 December 2011, lahar flood affected some areas in the District of Magelang, making around 2,836 people displaced, 746 houses destroyed and swept away.

Lahar flooding hazard also threatened many villages in Sleman District. High risk of lahar flood from Gendol River included Guling, Jaranan, Plumbon and Karanglo Sub-villages, in Glagaharjo Village. Opak River might bring lahar flood to Kliwang and Teplok Sub-villages, in Wukirsari Village.

Lahar Flood in Magelang

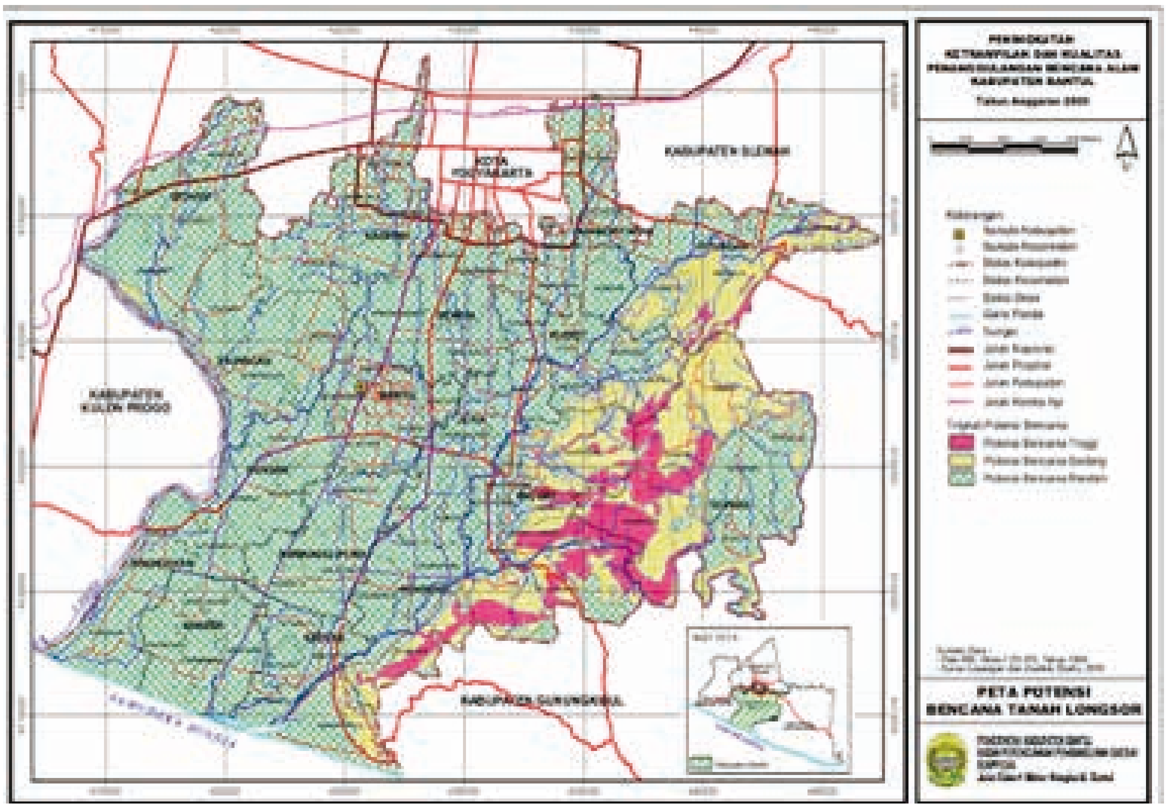
Landslide Risk in Bantul District

The District of Bantul faces multi hazards including earthquake, landslide, drought, strong wind and tsunami. Awareness of disaster has been increasing with the earthquake in Yogyakarta and Central Java on 27 May 2006, which constitutes a major disaster with huge impacts to Bantul District.

Regular hazard events such as flooding, landslide, and strong wind have sometimes been ignored by the public. However, these regular hazard events that come nearly every year are actually damaging to the people's economy and livelihoods, particularly poor people that do not have alternative to live their life. Disaster can really undermine development gains. Studies in recent years have demonstrated that disaster is particularly damaging to the marginal people, poor people, female-headed households, the elderly, people with disabilities and people that have poor health.

In Bantul District, areas that are prone to landslide are those that have extreme slopes. They are distributed in several sub-districts such as Piyungan, Pleret, Dlingo, Imogiri, some parts of Pundong, and some parts of Pajangan.

Amidst the high risk of landslide, pressure to the land continues to increase. Communities that have only limited capacity and resources continue to build their houses in areas that are actually not fit for settlements.



Landslide Risk Map

Land Areas Affected by Landslide in Bantul District

Community settlements in landslide-prone areas

Chapter 2
DISASTER IMPACT ON HOUSING AND SETTLEMENT

Post Merapi Eruption Recovery

Merapi eruption has destroyed numerous houses, buildings and settlements around the vicinity of the volcano that are affected by the pyroclastic flows and hot ashes. More than 2900 houses have been damaged beyond repair due to the pyroclastic flows of Merapi in 2010, and the other infrastructures have also been affected. The housing and settlement sector constitutes the most affected sector in 2010 Merapi eruption.

After the damage caused by Merapi eruption, the government developed a recovery plan to help survivors of the eruption regaining and rebuilding their lives and implemented rehabilitation and reconstruction of the areas. The government understood that this effort might require huge resources, as it aimed at creating better lives livelihoods that are safe from Merapi hazard.

Recovery of the damages suffered in various different sectors needed a concerted effort and cross-sectoral coordination that will ensure that each sector performed its functions in the overall recovery effort. Vertical and horizontal coordination had to be enhanced, and the role of the national government was key in this regard, as Merapi eruption has been declared as a national disaster.

To maintain effective coordination among the sectors, both vertically and horizontally, the government issued Presidential Decree Number 16 of 2011 on the Coordination Team for the Rehabilitation and Reconstruction of Areas Affected by Merapi Eruption in the Province of Special Region of Yogyakarta and Central Java.

Post-disaster recovery activities were done to meet the basic needs of the people and were also used as a means of building the capacity of the people in strengthening their preparedness and disaster risk reduction capacity:

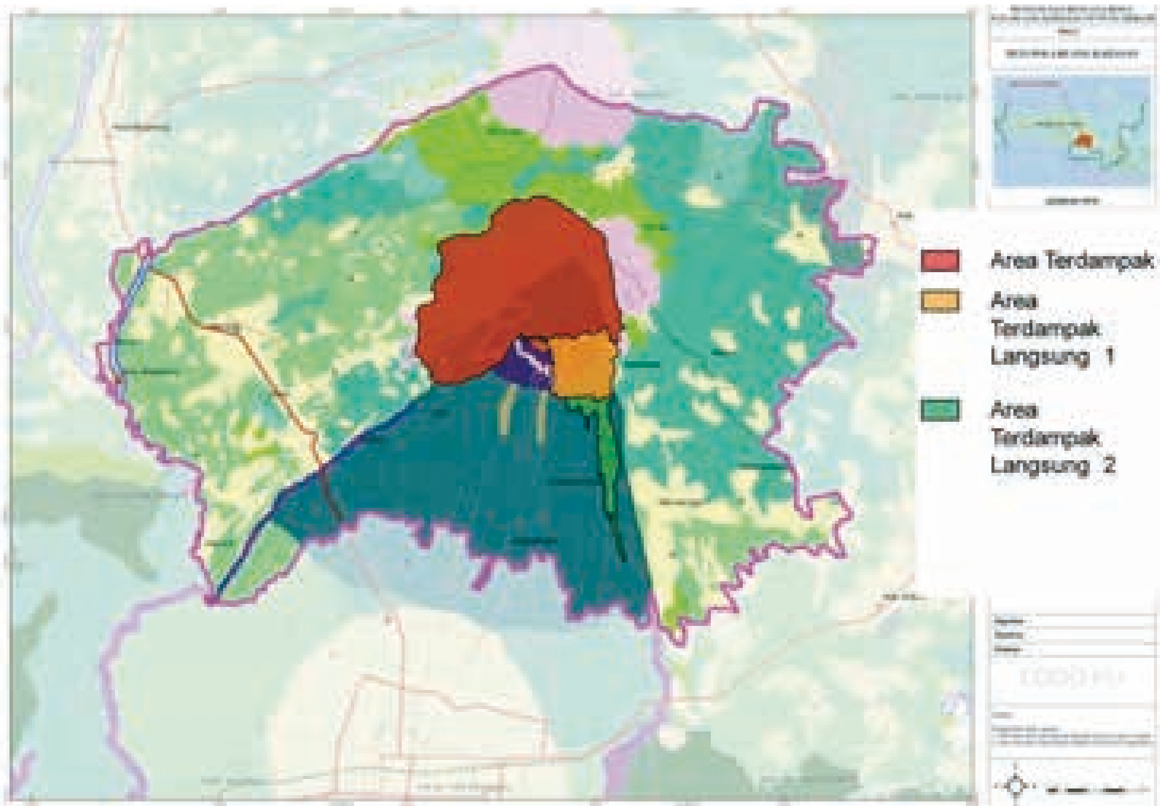
- Post-disaster rehabilitation and reconstruction activities were done to stimulate the affected people's economy as part of the efforts to achieve sustainable development goals, in the medium and long term;

Impacts of 2010 Merapi eruption on housing and settlements

- Spatial planning, land use and land-use control in Merapi volcano areas to develop protected forests, productive farmlands, and settlements that are risk sensitive;
- Utilization of some parts of the forests for development purposes outside forestry-related activities, without changing the functions and designated land-use of the forest areas;
- Employing an approach that was transparent, with provision of guidelines, technical guidance and accurate information on the rights and obligation of the survivor communities in the post-disaster rehabilitation and reconstruction process that emphasized disaster risk reduction.

The scope of post-Merapi eruption rehabilitation and reconstruction that used resettlement approach as outlined in the Directives of the RI Vice President, which would be implemented in stages for three years covering the budget year of 2011-2013 was as the following:

- Housing and settlement recovery that was based on the policy of safe resettlement using risk-sensitive spatial planning and design;
- Public infrastructure recovery to support people's mobility and economy in the areas, including vital infrastructure for disaster mitigation;
- Recovery of the social live of communities;
- Economic recovery that employed community-empowerment approach



Map of Affected Areas in Spatial Pattern

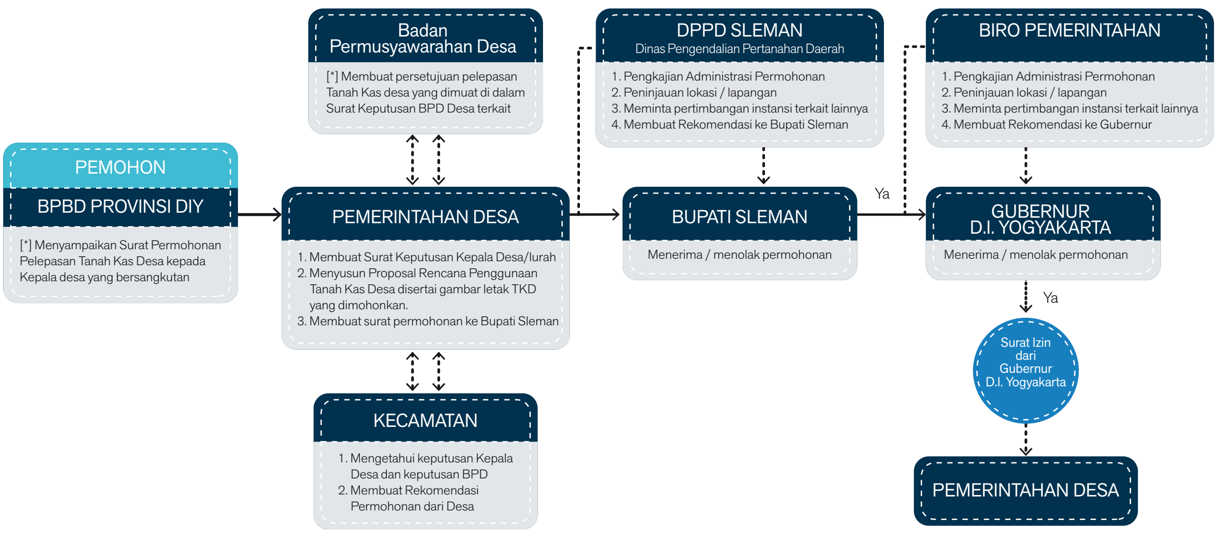
The effort to regain the people's life and livelihoods through the rehabilitation and reconstruction program has its own challenges. People living in Disaster-Prone Zone III, which were the most affected and the most dangerous areas, needed to be resettled to safer areas. Safer life and livelihoods needed to be provided to survivors that are resettled.

The resettlement process required land for at least 2900 houses that needed to be resettled. Scarcity of land availability would need a breakthrough, both in terms of land acquisition and the legal status of the land. Support from the government had been limited to stimulant funding, while this support should actually also cover appropriate funding for an effective and efficient resettlement.

Post-disaster rehabilitation and reconstruction process was not an easy endeavor that could be completed in a short time. Experiences have shown that it would take at least three years for a proper recovery. Some stages would need to be covered as the following:

- **Land Acquisition.** Land acquisition to provide lands for survivors resettled
- **Environmental Impact Assessment.** The local government would issue permit after the environmental impact assessment that needed to be carried out in areas that have high values for conservation and cultural heritage
- **Local Wisdom.** Cultural approach needed to be used in land acquisition for building resettlements as people were more comfortable if resettlement project paid attention to their local wisdom.

Diagram of Land Acquisition Process for Village Land



As the government considered the 2010 Merapi eruption as a national disaster, the central government coordinated with the relevant partners to accelerate post-disaster rehabilitation and reconstruction in the affected areas. Considering the importance of an effective and efficient rehabilitation and reconstruction, the President issued Presidential Decree Number 16 of 2011 on the Coordination Team for the Rehabilitation and Reconstruction of Areas Affected by Merapi Eruption in the Province of Special Region of Yogyakarta and Central Java.

The decree was prepared with the intention of accelerating the rehabilitation and reconstruction of the post-disaster areas, including through the integration of disaster risk reduction into the local government development agenda in the Province of the Special Region of Yogyakarta and Central Java. Coordination and synchronization were key in ensuring post-disaster programming that was well-managed, well-directed, transparent, accountable and integrated, with support from the central government, the local government, community and international organizations.

Mapping of High Risk Areas in Bantul District

Considering that landslide hazard event might incur casualties and significant economic losses, as well as impoverishing members of the community and erasing years of development gains, the District Government of Bantul is committed to take the necessary measures to mitigate and reduce the risks of landslide that may affect community members living in critical lands that are prone to landslide in the district.

The District Disaster Management Plan, as mandated by Law Number 24 of 2007 on Disaster Management and Government Regulation Number 21 of 2008 on the Conduct of Disaster Management, consists of:

- disaster management plan,
- disaster risk reduction,
- prevention,
- integration to development plan,
- disaster risk analysis requirements,
- spatial planning and implementation,
- education and training and
- technical standards for disaster management.

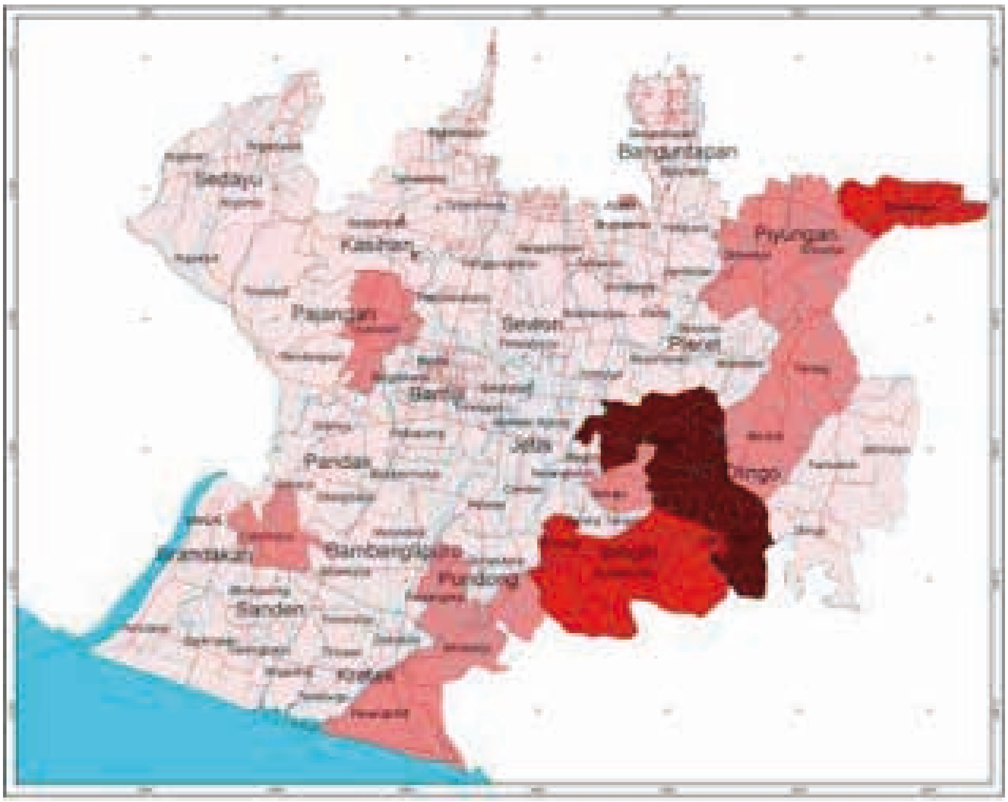
With the above mentioned condition, Bantul government saw that there is a need to make a mapping of landslide risks. The mapping was needed to identify the exact points of possible landslide and the number of people potentially exposed. The availability of such information and the number of potential people exposed might help the local government in planning mitigation and preparedness programs that were needed and also in securing the fiscal and other required resources.

From historical records of earlier landslide hazard events, some areas have been identified as prone to landslide in Bantul District. Those areas are presented in the following map.

Areas that have often been affected by landslide hazard include the following villages:

- Srimartani, Piyungan
- Wonolelo, Pleret
- Wukirsari, imogiri
- Selopamioro, Bambanglipuro
- Mangunan, Dlingo
- Karang Tengah, imogiri
- Muntuk, Dlingo
- Sriharjo, Imogiri
- Srimulyo, Piyungan
- Seloharjo, Imogiri
- Girirejo, Imogiri

As the first step to engage in better landslide disaster risk management, the government of Bantul District proposed to the Project Management Unit (PMU) of Rekompak program in the Ministry of Public Works that implemented the post-2006 Earthquake rehabilitation and reconstruction, to assist in the conduct of a more in-depth and scientific analysis of areas that were considered as highly prone to landslide hazard.



Landslide Disaster Events Map of Bantul District

Chapter 3

RESETTLEMENT AS AN OPTION TO KEEP PEOPLE SAFE FROM HAZARDS

Resettlement in Aceh Post 2004 Earthquake and Tsunami

In the morning of 24 December 2004, an earthquake with a magnitude of 9.1 on the Richter Scale and an epicenter 150 kilometer from the region, jolted Aceh. This earthquake was followed by a much more damaging hazard event, the tsunami. The Aceh tsunami was recorded as the biggest disaster in more than 40 years. The general public was initially not so aware of this catastrophic event.

In just minutes, houses in the vicinity of Aceh and Nias coastal areas were swept away. Major damage occurred everywhere in the affected areas, with much of the infrastructure totally destroyed including roads, bridges, and seaports. Many hospitals, markets, fishing boats, fish farms and people's houses were also damaged beyond repair. Utilities like electricity and clean water were very badly damaged. The power of the huge tsunami could even move a big diesel-powered electric generator ship from Banda Aceh beach inland three kilometers away from the coast. Approximately 800-kilometer of coastlines along the West Aceh had been brushed away. On that day, life for many people in Aceh went back to zero.

The calamitous damage caused by the tsunami also affected other countries such as Thailand, Bangladesh, Sri Lanka, India and even East Africa. At least 52 countries were affected by the tsunami that was known as the Aceh Tsunami.

The biggest loss from the catastrophe was the loss of lives of more than 220,000 people in just a short time. More than 635,000 people lost their homes. Many people were gravely injured and many others became permanently disabled. Households lost their family heads. Children lost their parents and whole families were suddenly scattered. The President at that time directly declared the tsunami as a national disaster and called for international assistance to deal with the aftermath of the disaster.

The Government of Indonesia established a team for assessing the damage and loss caused by the Aceh tsunami. The team worked

Impacts of Aceh 2004 Tsunami

for around two weeks under the leadership of the National Development Planning Board. Report from the team maintained that the Aceh Tsunami was the worst disaster in Indonesian history, with a total loss of around USD 6.2 billion. The damages inflicted by the disaster have gravely affected the national government as well as Aceh government.

To direct coordination and implementation of recovery programs in Aceh and Nias, the Government of Indonesia formulated an action plan based on the damage and loss report with the underlying principle of "building back better". Mitigation and preparedness to face future disasters became an integral part of the reconstruction effort.

Aceh rebuilding was conducted by using community-based approach and maximizing the engagement of the community members as a way of accelerating trauma healing. Bappenas and the Agency for the Rehabilitation and Reconstruction of Aceh agreed to employ a community-based approach in Aceh recovery. The government, which was represented by Bappenas and BRR, and the donors and World Bank agreed that community-based approach would primarily be used in housing reconstruction. The community-based recovery has led to the birth of a program called Rekompak, which stands for Rehabilitasi dan Rekonstruksi Masyarakat dan Permukiman Berbasis Komunitas (Community-based Rehabilitation and Reconstruction of Communities and Housing). The approach also emphasized the rebuilding of disaster survivors' livelihoods.

some key aspects of the Rekompak approach included partnership with stakeholders from all government tiers through a clear and supporting policy, and community members as decision makers that were supported by facilitators that played the role as catalyst. Basically the model put a complete trust on the communities to take the right decisions that might affect their everyday life and their environment. The MDF Rekompak project implemented by the World Bank has been successful in completing 15,000 houses in Aceh.

Reconstruction of post-tsunami Aceh

Post-2006 Earthquake Resettlement in Bantul, Yogyakarta

On 27 May 2006, an earthquake with a magnitude of 6.3 on the Richter Scale shook Yogyakarta and Central Java, leaving a trail of destruction that was far beyond what had ever been imagined. Big buildings were relatively untouched by the earthquake, but many houses had been destroyed or heavily damaged by the hazard event. It was indicated that the houses built by ordinary people did not meet earthquake resistance construction standards. This has caused needless damages and losses of human lives that were actually preventable with an earthquake with a magnitude of 6.3 on the Richter Scale.

The earthquake lasted for 52 seconds and caused more than 5,700 deaths, more than 40,000 people injured and 350,000 houses destroyed. Many disaster victims were trapped and buried under collapsing weak structures. An assessment by Bappenas and donors estimated the damage and loss to be around USD 3.1 billion. The economic impact of the earthquake had been felt by nearly 650,000 people working in small and medium enterprises in the affected areas. In Bantul District, Yogyakarta, 70% of houses suffered various degrees of damage.

Based on successful experiences from housing reconstruction in Aceh, and as requested by the Governor of Yogyakarta Province, the Government of Indonesia preferred to use Rekompak approach. Lessons learned from Aceh were implemented to conduct post-disaster recovery in Yogyakarta. Rekompak performance of was strengthened and results better than Aceh reconstruction had been achieved.

With support from donors' funding through the Java Reconstruction Fund provided to the Government of Indonesia and managed by the World Bank, USD 75 million out of a total of USD 94 million had been disbursed for the

An example of 'slum' challenges that needs to be addressed in PNPM Urban areas.
Left: a house in settlement area in northern Semarang city facing constant land subsidence;
Right: a slum settlement in Makassar
(source: rdwiyani)

rehabilitation and reconstruction of survivor's houses, which employed a community-based approach through the Rekompak program.

The housing reconstruction strategy in Java was aligned with the National Action Plan for Rehabilitation and Reconstruction, and was focused on the recovery of housing and public infrastructure, and the revitalization of people's economy and the local economy. Initial support had been provided to meet temporary shelter needs, housing and community recovery, while later support was provided for economic recovery.

In addition to housing reconstruction and donor-supported activities that employed Rekompak approach, the Government of Indonesia also implemented this approach in a wider scope through the entire housing and settlement reconstruction in Java, to address post-disaster recovery of subsequent earthquake disaster in West Java and tsunami in Pangandaran.

In less than two years, nearly 200,000 houses had been built employing Rekompak approach in Java. This achievement was considered as one of the fastest housing reconstruction experiences in the world.

Post-earthquake reconstruction process in Yogyakarta

Post-2010 Merapi Eruption Resettlement in Yogyakarta and Central Java

The Rekompak program that responded to the earthquake and tsunami in Java had nearly been completed when Merapi Volcano erupted throughout October-November 2010. At the time of the eruption, the Java Rekompak program 2006 would be completed by November 2011.

The Government of Indonesia called for an emergency meeting with Java Reconstruction Fund donors to discuss Merapi issue. Responding to government's request, JRF Steering Committee agreed to extend JRF program for one year until December 2012 to help survivors of Merapi eruption.

JRF allocated USD 3.5 million to implement recovery program in the aftermath of Merapi eruption. Since Rekompak program still had activities and field facilitators in the affected areas, it was easy for Rekompak to mobilize response very rapidly and increase support through on-going Rekompak programs in the field. Due to its capacity for scaling-up activities, JRF became the first program that provided significant allocation for Merapi while the other programs were still mobilizing resources.

The post-2006 Aceh tsunami reconstruction and post-2006 Yogyakarta reconstruction have showcased the values and effectiveness of community-based approach. It is evident that when communities are empowered to have their voices in rebuilding their houses and communities, with some clear limitations and guidelines, the results will be highly satisfactory for the owners of the house.

The government has once again decided to use community-based approach through Rekompak program for post-2010 Merapi eruption recovery. The Rekompak approach obliged house owners to be responsible for the reconstruction and rehabilitation of their houses. This has led to higher quality and satisfaction than similar other reconstruction programs. The Rekompak program gave disaster-affected communities the opportunity to rebuild their houses and public infrastructure through funding directly channeled to communities with direct grants from the government to community.

Rekompak approach has empowered communities to take their own decisions and organize their housing and settlements recovery on their own; something that has given people a sense of achievement and control of their future after their misfortune. Through communal actions (*gotong royong*), Rekompak at the same time assists the healing process of disaster survivors. Rekompak provides an approach that is flexible and can be continuously developed and adapted to meet various different conditions in Indonesia.

Chapter 4

RECENT EXPERIENCES IN RESETTLEMENT FOR DISASTER RISK MANAGEMENT

Housing Reconstruction and Settlement Rehabilitation in Merapi

DAMAGE AND LOSS ASSESSMENT

Immediately after the disaster, damage and loss assessment was done to determine the extent of damage and loss caused by the Merapi eruption. Assessment, damage and loss in all sectors were calculated using ECLAC. This method has been used to analyze post-disaster damage and loss in various countries and has been continuously improved since 1970. This method could determine the amount of loss and damage, needs for disaster recovery and impacts on each sector.

The assessed sectors are i) infrastructures consisting of housing, water, roads and transport, energy, and telecommunications, ii) social sector including education, health, religion, and facilities for the vulnerables and the poors, iii) productive sector including agriculture, animal husbandry, fishery, irrigation, trade, industry, finance, tourism, and iv) cross-sectors including governance and environment.

This methodology also takes into account the overall macroeconomic impact, which was divided into three parts, namely:

Damage. These are direct impacts, referring to assets, inventories and property rights. The assessment considers the extent of the damage. Typically, they are categorized into three categories namely heavily damaged, damaged and lightly damaged.

Loss. The indirect impacts refer to the affected areas such as: reduced production, declined revenue, and additional costs, for a certain time period until economic activities and affected assets could be recovered. These loss is calculated based on the present value. Due to its importance, it is highly required to take into account the period of time. If the recovery should be done in a long period of time, damage might significantly increase.

Based on the data as of 31 December 2010, it was identified that Mount Merapi eruption in Yogyakarta and Central Java caused damage and loss amounted to IDR 3.62 trillion detailed as IDR 2.14 trillion in the province of DI Yogyakarta and IDR 1.48 trillion in Central Java. It was recorded that as many as 3,023 houses in Sleman Regency were severely damaged and destroyed, 156 homes were damaged and 632 homes were slightly damage. Recovery efforts after the Merapi eruption in 2010 were carried out through rehabilitation and reconstruction activities. They were in accordance with the action plan for post-disaster rehabilitation and reconstruction of the Mount Merapi eruptions in Yogyakarta and Central Java Province during 2011-2013 published by BAPPENAS (National Development Planning Agency).

ECO-RESETTLEMENT

Arrangement of housing and settlements in the province of Yogyakarta and Central Java were implemented by a program called Rekompak. Considering the damage caused by Merapi eruptions, Indonesian government asked the World Bank to extend Rekompak program up to the areas affected by Merapi eruption in Yogyakarta and Central Java.

In conducting the rehabilitation and reconstruction using relocation method, an approach that took into account the environment and spatial planning was also used. For that purpose, the approach used was eco-resettlement.

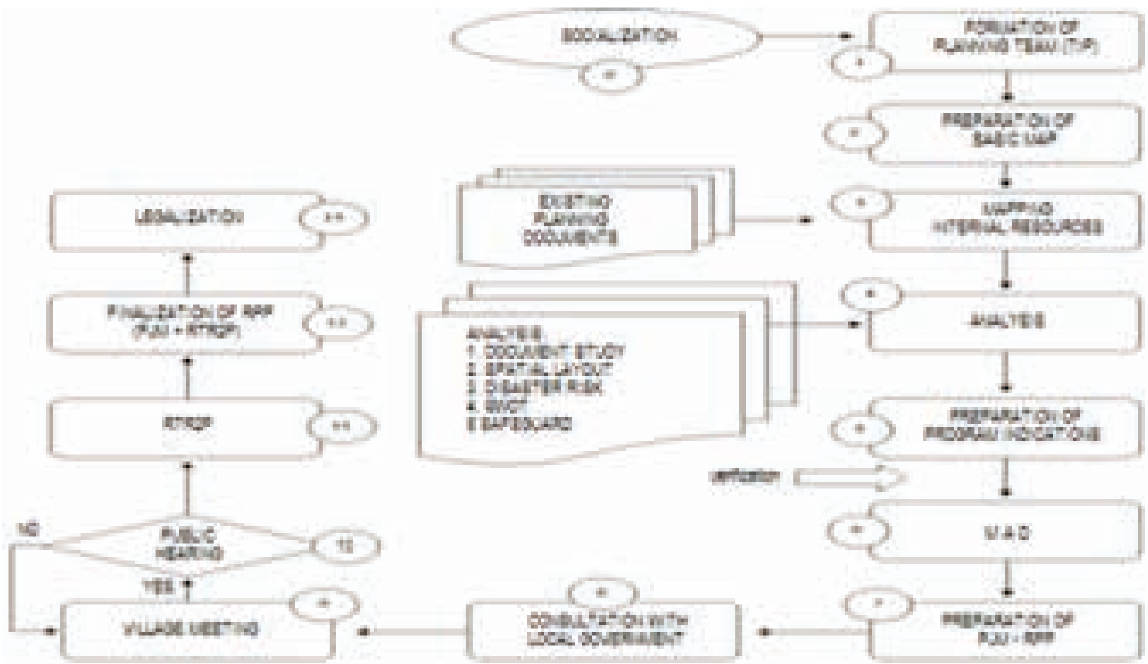
The efforts undertaken in the recovery process of the people's livelihood affected by the disaster on the basis of community-based Rekompak program are described as follows.

Settlement Arrangement Plan. Before conducting relocation, a document on Settlement Arrangement Plan (RPP) was prepared in advance. Settlements Arrangement Plan (RPP) or Community Settlement Plan (RPP/CSP) was a development plan at village level for a period of 5 years which was prepared based on aspirations, needs and future goals from the society to improve settlement environment condition and to encourage society readiness against disasters.

The purpose of RPP was as a guidance for people in building their villages by using a better planning, a spatial planning which was more responsive to disaster and better than ever overall. Preparation of RPP/CSP (Settlement Arrangement Plan) would be participatory which meant that it would involve three major construction elements, namely: public sector, government sector and business sector in the decision making process, especially by giving a stronger role to the public sector for whom the construction was done. Steps in preparing RPP can be seen in the following flowchart.

Build Back Better Principle. In its implementation, the relocation used "Build Back Better" principle, as the integrating element for Disaster Risk Mitigation to the relocation program. This relocation was implemented by using Eco-resettlement concept namely integrated resettlement development and paying attention on the environment and nature, so that the preservation of nature would remain intact. By using an integrated or clustered system, it was suitable to be used in limited

Flowchart in preparing Settlement Arrangement Plan



land area. It was applied for resettlement during this Merapi post-eruption relocation. This eco-settlement concept was also applied in a communal cages and communal IPAL (Waste Water Treatment Plant).

Land Acquisition. Land Acquisition for relocating the community used several methods as follow:

1. Communal Village Land Assets - according to the Regulation of the Governor of DI Yogyakarta, Village Land Assets cannot be used for housing or residential area so there should be a special permit related to land development for rehabilitation and reconstruction after the Merapi disaster.
2. Communal Independent Land - people jointly bought a large land to be used for residential construction related to post-Merapi rehabilitation and reconstruction.
3. Individual Independent Land - land used to build settlements belonged to the owner himself.

Rekompak Principles and Values. These principles were critical in the program. The principles were solidarity, openness, transparency, accountability, independence and the use of local resources.

While the values were community-dependent development, which meant that the program was to put the community as the main resettlement development actors, and value-focused development, which meant that the reconstruction process was based on the development of community values.

Community-based Approach. The approach system was a community-based approach system for mapping, site plan and implementing program relocation activities after the eruption of Merapi. In order to implement the program, a capacity building activity was conducted to enhance the community's capability, especially in the areas of procurement, accounting, reporting, banking system and understanding disaster risks in their region.

Each settler group consisted of around 10-15 households. It had an organizational structure consisting of a Chairperson, Treasurer, Secretary and Executive Team. Selection process for each position was done by means of deliberation and consensus method which manifested the existing local wisdom in the community.

Direct Assistance. Direct assistance used a team of facilitators. Each team consisted of 9 personnels with expertises in civil engineering, architecture, economics and social. Each team provided direct assistance to 10-15 settler groups. This pattern was very influential toward the speed of relocation program implementation, of which approximately 500 homes could be completed within one year.

The facilitators who assisted the community were recruited on the basis of expertise and skills assessment undertaken by District Management Consultants (DMC). As for administration and payroll were done by the Work Unit for Building and Environment Planning (PBL,) of the Public Works Department of DI Yogyakarta.

Legal Basis for Recovery Implementation. To be used as the basis for therehabilitation and reconstruction, Presidential Decree Number 16 year 2011 regarding Coordination Team for Regional Rehabilitation and Reconstruction after Mount Merapi eruption in D.I Yogyakarta and Central Java was stipulated; of which was followed by the stipulation of:

1. Regulation of the Head of BPNB (National Board for Disaster Management) No. 5

year 2011 on the Action Plan for Regional Rehabilitation and Reconstruction after Mount Merapi eruption in D.I Yogyakarta and Central Java as a reference in implementing rehabilitation and reconstruction;
2. Regulation of the Head of BNPB No. 6 year 2011 on the Organizational Structure of Technical Supporting Team Technical for Regional Rehabilitation and Reconstruction after Mount Merapi eruption in D.I Yogyakarta and Central Java;
3. Decree of the Head of BNPB No. 127 year 2011 on the Appointment of Technical Supporting Team Personnels for Regional Rehabilitation and Reconstruction after Mount Merapi eruption in D.I Yogyakarta and Central Java;

In the action plan for the rehabilitation and reconstruction after Mount Merapi eruption, it was clearly stated that the rehabilitation and reconstruction activities shall be carried out by using an approach of residential relocation from Disaster-Prone Areas (KRB) III using REKOMPAK scheme. Residential relocation and settlement activities became the locomotive for the rehabilitation and reconstruction activities, which provided input to Spatial Planning revision of Sleman, Klaten, Boyolali and Magelang regencies.

All citizens, who were willing to be relocated, were facilitated with land redressing. The value was calculated by considering the Taxable Object Value (NJOP) of the original location and was provided with land ownership certificate. As for the provisions for providing assistance, the details were as follow:

Housing construction assistance was amounted to IDR 30,000,000,-/unit; The community was given a freedom in determining the house type, with a provision of minimum building area of 36 m2; Total land area for each house was 100 m2, added by 50 m2 per house for public and social facilities, therefore the total provided land area was 150 m2 per household.

Earthquake Resistant Building Construction. The building had to meet criteria of earthquake-resistant structures of which should be through a direct assistance in its construction. Residential construction was carried out by the government and stakeholders implemented this relocation activities using a community-based approach. A series of activities were carried out in order to achieve the program objectives, such as:

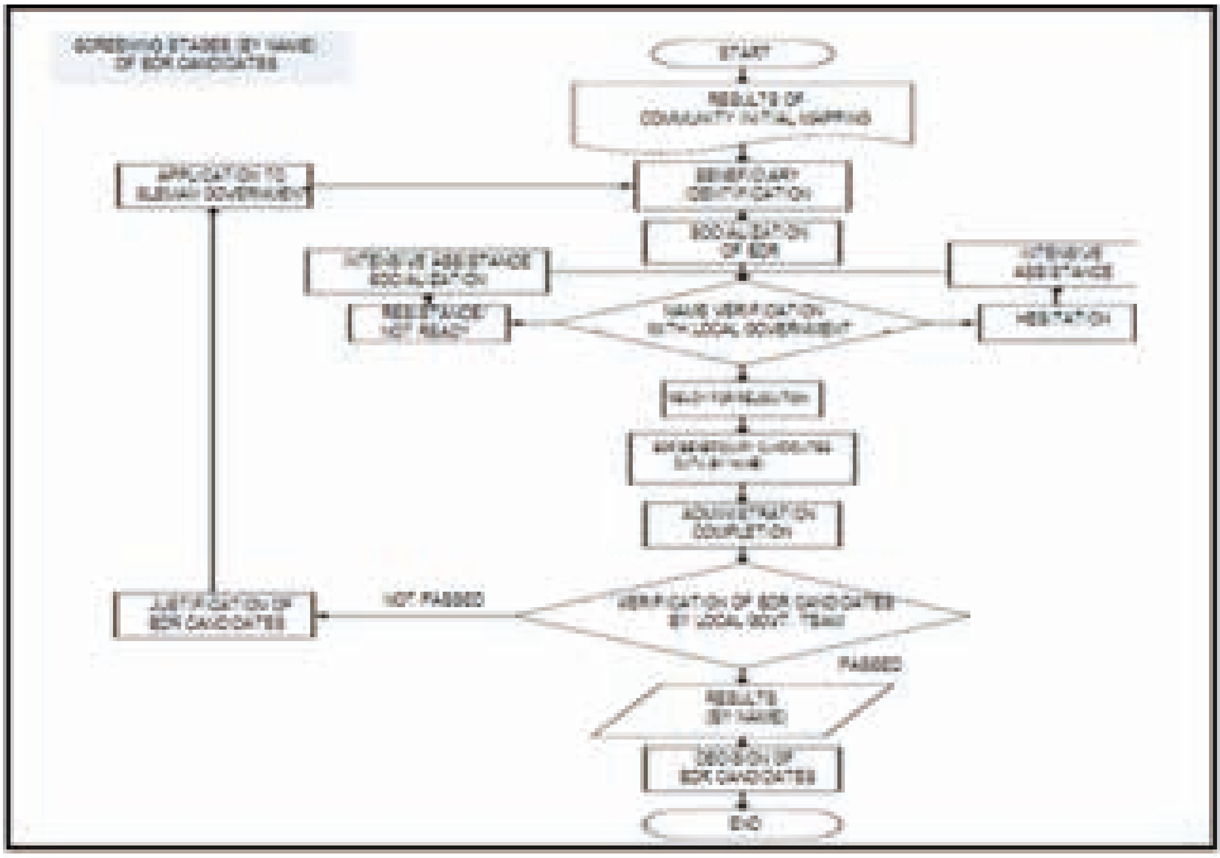
Settlement construction planning consisted of: a coordination meeting for socializing and selecting volunteers, training volunteers, and FGD on the reflection of village development impact and planning. Data collection and mapping consisted of the following activities: self-mapping, community discussion to determine prospective housing assistance beneficiaries and damage level of houses, as well as public assessment. Settlement Arrangement Plan (RPP) consisted of: establishing a Planning Team (TIP), preparing RPP, women and vulnerable group meetings in preparing RPP, village discussion, and inter-village discussion. RPP integration in the regional development plans consisted of: RPP draft consultation, RPP finalization, and RPP workshops at district/city level. House construction consisted of: the establishment of settler groups (KP), preparation of technical details of housing construction plan (DTTP), women and vulnerable groups in the context of preparing DTTP, and DTTP verification. Disbursement of funds and development implementation.

Permanent Residential Implementation Process. Selecting Beneficiaries was conducted by following the criteria specified in Rekompak program.

Criteria for Prospective Home Fund Recipients

CRITERIA	EXPLANATION
Households that had lost their houses due to Merapi eruption or affected by it in DIY and Central Java	▪ The recipients of BDR were "Households". It means that if there were many families in one house, they would have the right only for one BDR house. Conversely, if there was only one person in the household (single and there was not any other family members), she/he would still receive BDR fund allocation for one BDR. ▪ Household/family in question was a unit of family or individual person who lived in the house and cared for themselves prior to the Merapi eruption in 2010 or the cold lava flood that followed
Their house was located in a prone to disaster area	▪ The prone to disaster areas were Prone to Disaster Areas (KRB) of Merapi, which based on the Center of Volcanology and Geological Disaster Mitigation (PVBMG) were categorized into 3 KRBs, namely KRB III, KRB II, and KRB I ▪ KRB III was a prohibited area for settlement
Their house was lost/collapsed/ heavily damaged and not appropriate for settlement due to the eruption or cold lava flood and they had not built another house outside the area of KRB III by using private fund or assistance from other parties.	▪ Lost means that all or most part of the house was covered by volcanic materials (sand and rocks) or cold lava. ▪ Collapsed means that the house was collapsed after being hit by volcanic materials or cold lava. ▪ Heavily damaged means that the house was not proper for settlement any longer based on technical assessment although it was still on the land.
They had legal ownership of the house	The status of ownership should be proved by a testimonial letter from the village.
They had land use right on the new location	▪ Land title: it could be proved by a certificate/letter C/other testimonial letters or by a testimony from the surrounding neighbors (neighbor who lived on the left, right, front or behind the house) ▪ Land Use Right: it could be proven by a testimonial letter saying that they would be granted/inherited/permitted the use for at least 15 years and signed by a testifier.
They were not and/or in the process of acquiring similar assistance from other parties.	Clear
They had an intention to re-build or settle in a safe location or in a residential areas stated in the spatial plan set by the local government	▪ A safe location was a safe location based on the categories of prone-to-disaster areas as set by PVMBG ▪ A location which was located in the residential area as stated in the spatial plan set by the government. It means that the location should be in accordance for its land utilization as set by the local government through the Regional Spatial Planning (RTRW) of the City/ District or other regulations.
They were willing to tear down their house on the old site	
They were willing to follow any stipulated regulations	Clear

Stages for Selecting BDR Recipient Candidates



Land Selection. Geologically, land selection for relocation was done by BPPTK (Center for Geological Disaster Research and Technological Development), based on the historical impacts of previous Mount Merapi eruptions. Thus, a safe area could be known and determined for relocating the citizens. The venues were as shown in the map below.

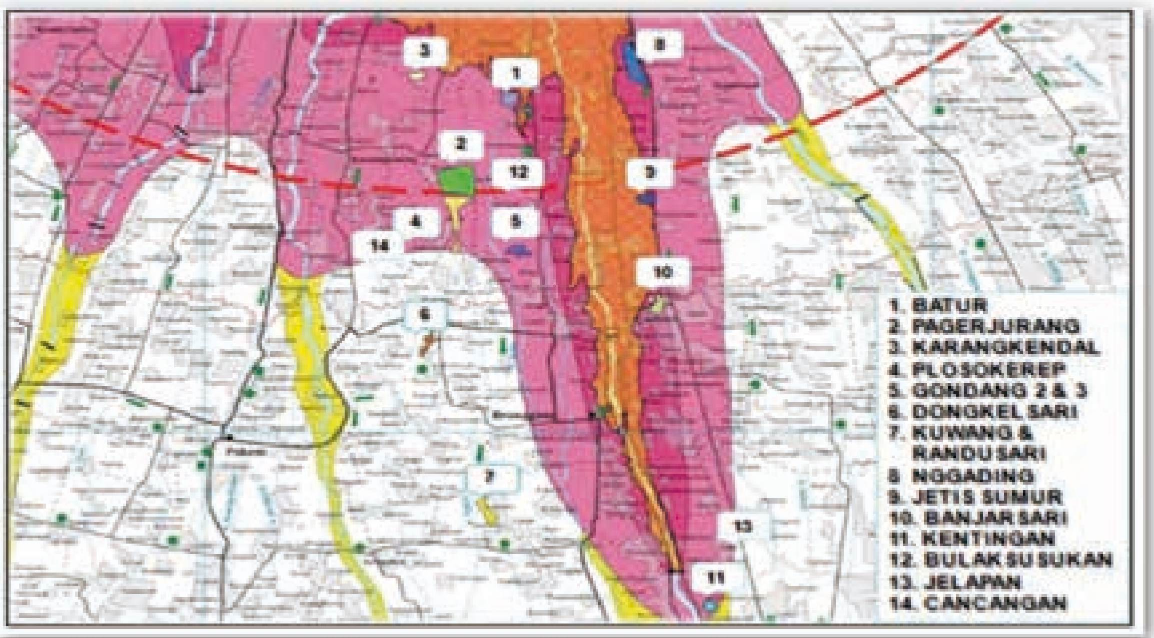
Village Land Assets Conversion and Their Licensing. According to the Regulation of the Governor of DI Yogyakarta, Village Land Assets could not be used for housing or residential so there should be a special permit related to land development for the rehabilitation and reconstruction after the Merapi eruption.

Lands which were left by their owners remained as the owners' property and got land titles, but those lands should not be used for residential/ settlements and could only be used for economic activities, such as agriculture or plantation. As for the lands located in the relocation site have been certified on behalf of the concerned and should not be handed over/sold or pawned.

Environmental and social safequard. In terms of Environmental and Social Safeguard, the construction of permanent housing had to refer to general policies and guidelines to achieve the following objectives:

1. Protecting human health;
2. Preventing or redressing any loss of livelihood;
3. Preventing environmental damage as a result of individual investments or their cumulative impacts;
4. Avoiding or minimizing involuntary land acquisition and/or relocation, and handling the impacts of land acquisition/relocation, if any; Avoiding conflict among the community members and strengthening social bond among the community;
5. Preventing or compensating any loss of livelihood caused by land loss, or loss of access to natural resources including those generated by the project;
6. Restoring livelihood conditions of the affected communities.

Distribution map of relocation sites



Flowchart for Village Land Assets Acquisition for the Relocation Site

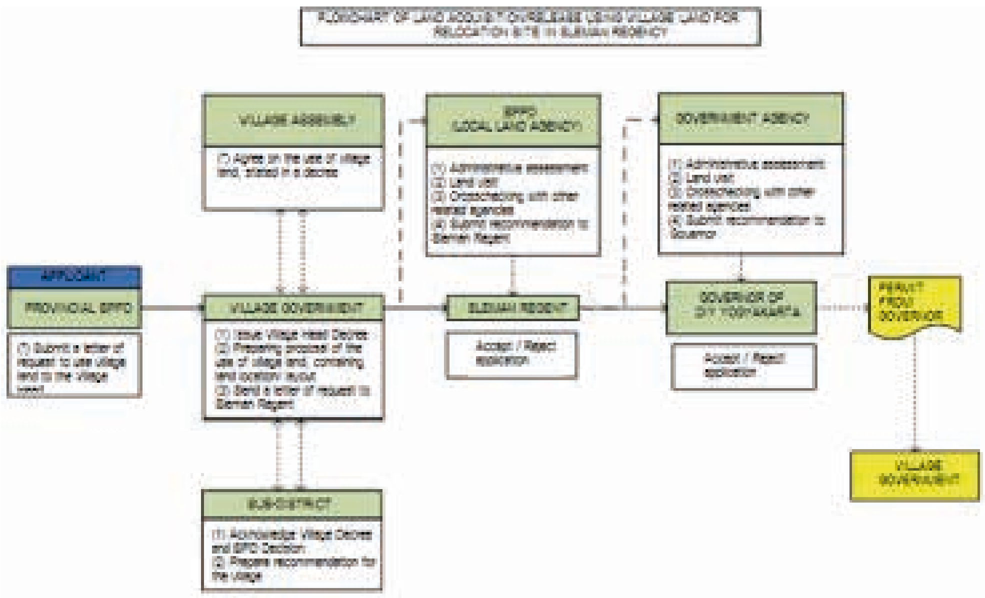
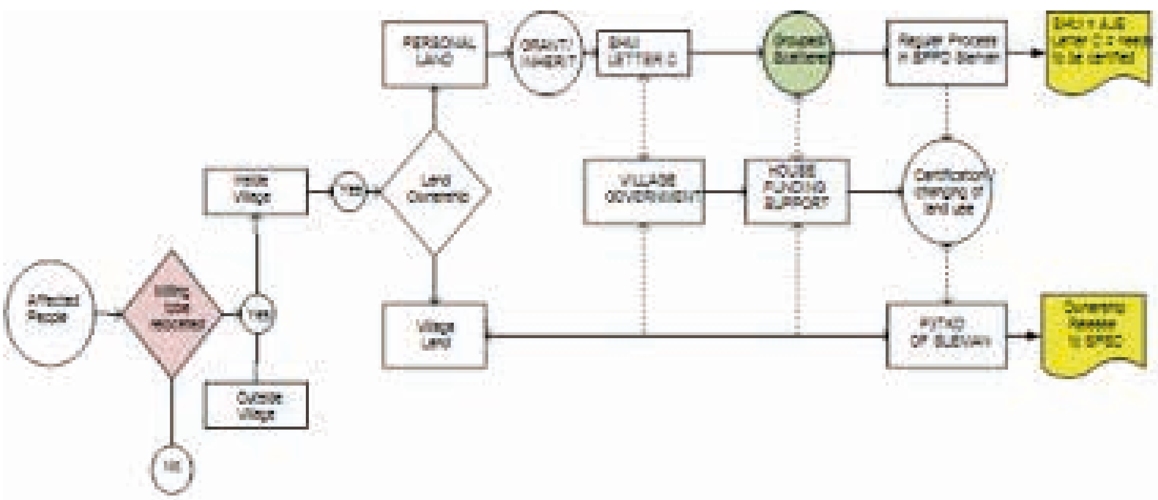
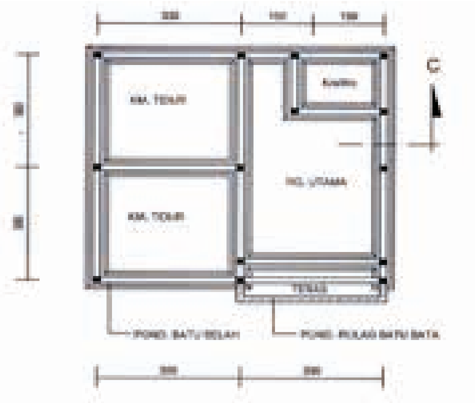


Diagram of Independent/Personal and Group Land Acquisition Process



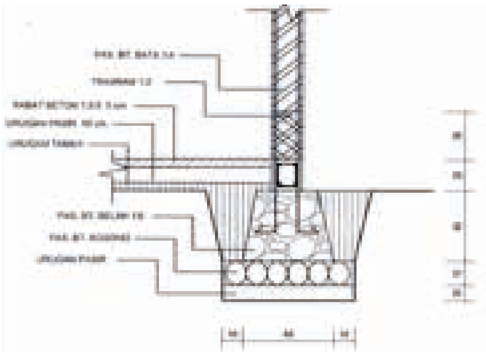
Earthquake Resistant Housing Construction

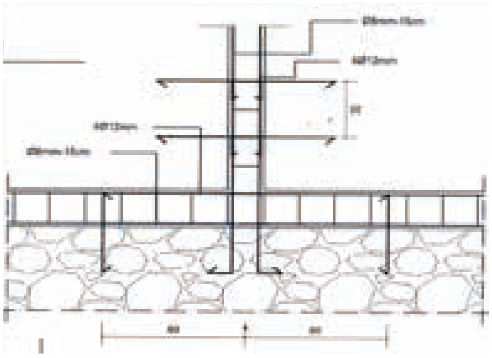
FOUNDATION

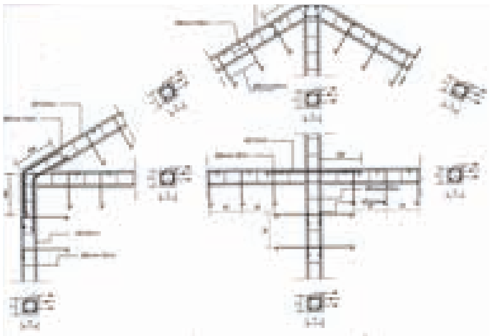


FRAME STRUCTURE

FRAME STRUCTURE

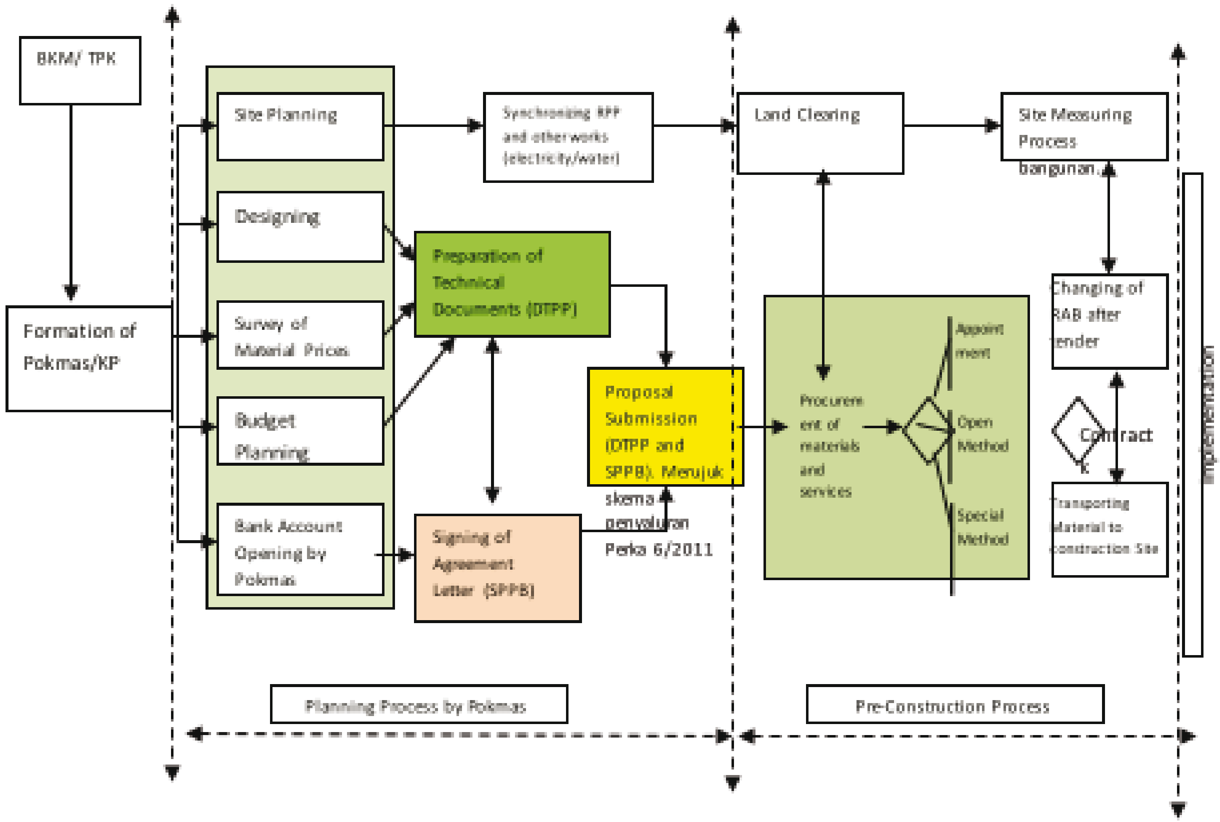






FRAME STRUCTURE

Parallel process in housing reconstruction at the community level



ECO-RESTORATION

The eco-restoration program was the speedy restoration of the affected regional ecosystems to support the community-based rehabilitation and reconstruction program after the Merapi eruption in 2010. The goal was to seek for opportunities and efforts that could be made for recovering community lands affected by the Merapi eruption. Another goal to be achieved by this program was to provide an alternative income for the affected community in short and long terms.

The eco-restoration program was done in 5 hamlets in Kepuharjo village, Cangkringan Sub-district, Sleman District. The restored land area used as a demonstration plot (demplot) was more than 15 hectares with an intensive community engagement using a community-based approach. The selected locations were in two regions affected by the eruption, namely Direct-Affected Area (ATL) I and II. ATL I was closer to Merapi and has a thickness of eruption material up to 3 meters. ATL II has a thickness of less than 1 meter.

The selection of vegetation was done to meet short-term and long-term goals of the program determined previously. For the short term, fruit-producing plants such as banana and papaya were planted. As for the long term, sengon trees were planted. In addition to the goal of improving community's economy, the program was also aimed for land conservation and adaptation to climate change. Selection of different types of vegetation starting from small plants to woody plants was also intended to create complex agroforestry which was similar to natural forests.

The cropping patterns which were generally used were alternate rows of which forest plants and agricultural crops were planted alternately with a space between each forestry plants was 6 meters, as well as for agricultural crops. After a row of sengon trees, a row of papaya trees were planted and on the boundaries between farmers' fields, usually in form of terraces, fruit plants or Multi-Purpose Tree species were planted. Because the land conditions before being converted into demplot were varied and there were different needs of the farmers, there were variations of implementation. The activities consisted of:

A brief assessment of the field situation. A survey was conducted to determine on-site physical conditions. An assessment toward the physical condition of the land was done by direct observation after coordinating with the village government regarding priority locations to be used as demonstration plots. An assessment toward socio-economic conditions was also conducted through interviews with various sources, program socialization discussions and group discussions. The team providing direct assistance lived in the assisted villages to triangulate the data obtained from various sources by direct observation on the people's daily life.

Determining Assisted Groups and Demonstration Plot Location. Criteria for ecosystem restoration program participants or target groups defined by the direct assistance agency were villagers whose lands or settlements were destroyed by the eruption of Merapi, covering ATL I and ATL II in Kepuharjo village. Initially, it was only implemented in Kopeng hamlet, but then Batur, Jambu and Petung hamlets were added, citing the need for demonstration plots in land with thick eruption material, the need for spots to learn agroforestry, the need to learn how to protect vulnerable disaster points such as river banks and areas vulnerable to landslides. Palemsari hamlet was added recently to support tourism village and to support the community businesses. In total, the total area reached 15.8 hectares.

Involvement of other parties in implementing the project. Socialization of ecosystem restoration activity plan for villages affected by the Merapi eruption to the community was conducted through meetings facilitated by Rekompak in temporary residential area in Plosokerep and Gondang. During the socialization, village governments were involved to ensure smooth coordination since the beginning of the program. The village government also participated in determining two locations in the village. The involvement of farmers owning the demonstration plots was conducted through socialization to explain the program purposes as well as to get inputs and feedbacks from the community. This process generated inputs on the types of plants preferred by the community as well as information on the availability of land and the willingness of the community to engage in the program.

Ecosystem restoration participatory planning. Participatory planning at farmer group level was conducted through a series of meetings starting from promoting the program, extracting information about community's livelihood patterns before and after the Merapi eruption in 2010 and community's expectation on the alternative livelihood patterns that could be applied during the rehabilitation and reconstruction period. Restoration program was perceived by the community as a program to generate income from agriculture by planting a commodity of which the market was clearly available. Community planning process resulted in agroforestry design and cropping patterns.

HAMLET NAME	WIDTH	ACTIVITIES
Kopeng	8.9 ha	Thai Papaya and Jeunjing/sea sengon were planted using alternate rows system with a spacing of 3x3 m. Under the Sea Sengon and Papaya, seasonal crops such as beans, chili or grass to feed livestock were planted. Those plants also had a function to strengthen the terraces. Terraces were also interspersed with fruit trees such as banana, jackfruit, avocado and durian. Selection of vegetation was done by discussion. Sea Sengon was chosen because the farmers knew these plants well. As for papaya, it was because the market was wide open and this plant might grow well in this environment.
Petung	1.3 ha	Mixed garden was designed to become a stand with a storied header of forestry vegeations at the top of the canopy and plantation crops and vegetables at the top of the canopy. The plants were jackfruit, mango, banana, papaya, avocado and nutmeg. Sweet potatoes and cassava were also planted.
Batur	1.4 ha	Being a land in ATL I, restoration of soil structure was the first action to perform in restoring an ecosystem, namely by strengthening the terraces and creating land boundaries using Lamtoro plant, then providing input in forms of soil and organic materials which allowed plants to grow optimally. Riverbanks and inter-land terraces were planted with Lamtoro and Gamal to strengthen the slopes and terraces by utilizing the roots ability to bind the soil. Planting vegetation also aimed to restore humus through fallen leaves to improve availability of nutrients in the soil
Jambu	1.7 ha	Rehabilitation of soil condition by stabilizing soil which was exposed to rain or its flow and increasing organic material from the fallen leaves. Lamtoro and Gamal were planted on the inter-field boundaries. Papaya plants were combined with Jeunjing (Seas Sengon) and coconut trees with a spacing of 3x3m and 2x3m. Water tank was made to anticipate dry season.
Palemsari	2.5 ha	The program was conducted also to support the tourism village program and to provide an example of land optimization for community economic empowerment. The implemented pattern was enrichment with new plants to enrich the composition of existing plants. The implemented pattern was along-the-boundary vegetation and enrichment plants with a space of 3x3 m and adapted to the land. Terrace-strengthening plants other than grass as well as acacia, were used as fuel and also batik Soga dye.

The success of the overall program reached 70% of the total planted area. The existing land in ATL I got a lower production rate. Community income increased with an additional income of up to IDR 500,000 per month, because of the existence of marketing system formed as a part of the program. Community involved in the program were given an additional 15 hectares of restoration land by the Regional Government along with 25,500 trees.

Resettlement for Landslide Risk Mitigation in Bantul Regency

A landslide risk study was conducted in a participatory manner in which the community participated on site to learn about landslide parameters. Among others, the parameters were:

Parameters for Landslide Risk Study

NO	PARAMETER
1	Soil Texture Class
2	Thickness of Land solum
3	Rocks Weathering Rate
4	Slopes
5	Morphology Types
6	History of landslides
7	Vegetative Density
8	Land Use
9	Rainfall data

Community involvement in mapping landslide risk was carried out based on the following objectives:

1. Providing an understanding of landslide-prone areas existed in each village
2. Communicating technical parameters as well as matters related to landslide-prone condition
3. Communicating the stages in the landslide study

From the landslide study results, there were 618 Houses (inhabited by 658 Households) included in the red zone (high risk level) spread over three (3) relocation pilot villages; Srimartani as many as 158 houses, Wukirsari as many as 279 houses and Wonolelo as many as 181 houses.

Number of Houses with High Risk

NO	VILLAGE	RED ALERT
1	Srimartani	158
2	Wukirsari	279
3	Wonolelo	181

Risk-mapping for landslides was continued to 8 villages and the results were shown in the following table.

Number of Houses with High Risk

NO	VILLAGE	RED ALERT
1	Selopamioro	461
2	Mangunan	113
3	Karang Tengah	63
4	Muntuk	116
5	Sri Harjo	119
6	Sri Mulyo	281
7	Seloharjo	224
8	Giri Rejo	21
TOTAL		1396

Of the number of houses with high risk above, the Local Government of Bantul Regency made a follow-up action by means of relocation program to a safer place. The first relocation program was implemented with support from the Rekompak program which was close to completing the rehabilitation and reconstruction in the areas affected by the 2006 earthquake in Yogyakarta. In this relocation program, the government provided converted village land assets approved by the provincial government of DI Yogyakarta.

Number of Relocated Household Heads

NO	VILLAGE	TOTAL
1	Srimartani	13
2	Wonolelo	20
3	Wukirsari	36
4	Wukirsari (Replication)	25
5	Sriharjo (Replication)	11

The construction was implemented gradually, both for construction of houses and public facilities. Those activities consisted of:

Permits Preparation. Land Conversion and permit land conversion were done in Wukirsari and Srimartani villages which have used village land assets for the relocation. The process was carried out through a mechanism of village regulation making regarding land conversion of agricultural land into residential land. The village regulation was submitted to regency level and after acquiring receipt from the Regent of Bantul, it was later submitted to provincial level to acquire a Decree from the Governor of DI Yogyakarta on village land assets conversion. The Governor's Decree on land conversion in Wukirsari and Srimartani villages were legalized by the Governor of DI Yogyakarta.

Map of Areas Prone to Landslides in Wukirsari Village, Imogiri Sub District

Construction Permit (IMB) and Land Drying. Residents benefited from a relocation program needed to have IMB and Land Drying Permit for agricultural land to be used or built as houses. IMB application for Wukirsari, Wonolelo and Srimartani Villages and Land Drying for Wonolelo and Srimartani Villages was submitted in form of proposals through Kesbangpol Bantul of which was forwarded to Bantul Regent along with a copy to the relevant SKPD.

SITE PLAN PLANNING

Bantul Regency was committed to fulfilling community needs for clean water and electricity. The needs of clean water were fulfilled from PDAM pipelines. Electricity was provided by PLN. The availability of water and electricity would support the occupancy rate of the constructed houses.

Bantul would also build a drainage system in the relocation sites. Construction of drainage would use Regional Budget (APBD). While it had not been built yet, natural drainage was utilized.

The implementation process as mentioned above was also applied in Wonolelo and Srimartani villages. Principles and mechanisms of the Rekompak program were implemented properly to ensure environmental setting in a safer place away from landslide risks in accordance with the purpose of the relocation activities.

Implementation of Construction in Wukirsari Village

NO	WORK ITEMS	IMPLEMENTATION	TARGET
1	House	▪ 32 houses on the village land assets until the roof tiling work had finished. ▪ 4 houses on private land until the roof tiling work had finished	100 % of RAB (Budget Plan) , up to rafter and lath works
2	Talud	634m3 (100 %)	634 m3
3	Concrete Block Road	140 m (100 %)	140 m
4	Communal MCK (Public Bathing, Washing and Toilet)	Walls were painted. (100 %)	Finished and painted

Wukirsari Village Site Plan

Land relocation region of Wukirsari village land asset 0 %

Land relocation region of Wukirsari village land asset 10 %

Land relocation region of Wukirsari village land asset 20 %

Land relocation region of Wukirsari village land asset 50 %

Land relocation region of Wukirsari village land asset 70 %

Land relocation region of Wukirsari village land asset 100%

Chapter 5
LESSONS FOR SCALING UP

The rehabilitation program after the Merapi eruption in 2010 was considered successful in relocating the impacted communities using a community-based approach. The use of the community-based approach through direct assistance and coordination between government agencies was the key to the success of the program.

Housing and Resettlement Rehabilitation in Mount Merapi

Learning from the relocation program in Sleman Regency, Special Region of Yogyakarta and Magelang Regency, Central Java province, there were some key activities that can be used as a lesson. The rehabilitation and reconstruction program with a community-based approach was implemented within the following framework:

- The fulfillment of basic human needs, means of developing community capacity to increase preparedness and disaster risk reduction, community economic stimulation and the achieving the goals of sustainable development, both medium-term and long-term.
- Structuring, utilization and control of space in the area of Mount Merapi for the development of protected forest areas, productive land and settlements using an approach with disaster risk reduction.
- The utilization of some areas of the forest for development outside forestry activities without changing the function of the forest.
- The application of the principles of transparency approach, by providing guidance, technical assistance and accurate information about the rights and obligations of the affected communities in the process of post-disaster rehabilitation and reconstruction activities that promote disaster risk reduction.
- The capacity building of the community in planning and managing community-based regional development programs.
- The opportunity to implement better and more efficient governance and relationship between actors within the government.

The scope of the rehabilitation and reconstruction after the Merapi eruption used a community-based approach by paying attention to the followings:

- The rehabilitation of housing and settlements referred to relocation policy that was safe for settlement regarding the space layout and design that was based on mitigation and disaster risk reduction.
- The restoration of public infrastructure supported the mobility of the people and the economy of the region including vital infrastructure for disaster management.
- The restoration of the social and economic life of the society.

The program was designed and implemented by the central government and was handed over to the local government. The program was ended in November 2014, and was followed up by the local government.

Once the permanent housings were built, Sleman Regency Government continued to make efforts to ensure the recovery process of the affected people could be achieved. There were also efforts to ensure that the people would keep inhabiting the houses and to prevent them to return to the old houses. The efforts made are as follows.

- Increasing the welfare of the residents by enabling them to provide for the family by providing trainings on home industry with the goal of creating new economic resources, such as mushroom cultivation, batik making, and food manufacturing.
- Issuing new certificates for the old land and labeling the cover with the words "not for occupancy", in anticipation of the ideas circulating among the residents that the land would be taken by the state. This certification also explained the legal status of the land and avoided the problems of land ownership in the future.
- To follow up the issue of social change such as environmental hygiene, the Government of Sleman conducted intensive socialization on waste treatment.
- To follow up the issue of social change such as the neighboring system (RT/RW), the social system in the old location was adopted in the new location. The neighboring system in the new location was the same as the old location.
- To anticipate environmental problems, the Sleman Government facilitated waste processing in the new location and provided various plants for green open spaces.
- There was a communal Wastewater Treatment Plant (WWTP) to avoid environmental contamination in the new location.

Resettlement for Landslide Risk Mitigation in Bantul District

Follow-up to the Risk Map Assessment. Bantul Government with the support of the central government through the Rekompak program conducted relocation activities with a community-based approach and independent and communal methods. The communal method was the use of village land, while the independent method was the use of people's land.

- The relocation program was started with relocation piloting projects in three villages at high risk with the support of the ongoing Rekompak Program in Bantul after the earthquake in Yogyakarta in 2006. The piloting program implemented in Srimartani Village involved 13 households, In Wonolelo village 20 households, and in Wukirsari village 36 households. A total of 69 households of the 618 households in the three villages with a high risk have been relocated to a safer place.
- With the support of the Global Facility for Disaster Reduction and Recovery (GFDRR) through the Disaster Risk Management (DRM) Unit of the World Bank, in ….. Bantul Regency continued the assessment to

another eight villages. Bantul Government followed up the results of the risk assessment by including the relocation program and its financing into the local government's work program and budget (APBD). In the early stages, Bantul Government planned to relocate people to a safe place with a minimum target of five households per year.

- In 2013, Bantul government was able to relocate 11 households in Sriharjo Village with the funding of IDR 20 million per household. In 2015 the provincial government of Yogyakarta and Bantul government were successful in relocating 25 families in Wukisari Village, Imogiri Sub-District with IDR 30 million per household.
- In 2014, funded by the local government's budget, Bantul government has also replicated the regional mapping study assessment to the area with high risk of landslides in five villages and in two sub-districts. In Pajangan Sub-District they were three villages namely Guwosari Village, Village, Sendansari Village, and Triwidadi Village, while in Dlingo Sub-District were Jatimulyo Village and Terong Village.
- Bantul government still tried alternative funding outside the local government budget to accelerate the relocation programs for the people living in the areas at high risk of landslides.

Resettlement for Local and International Learning

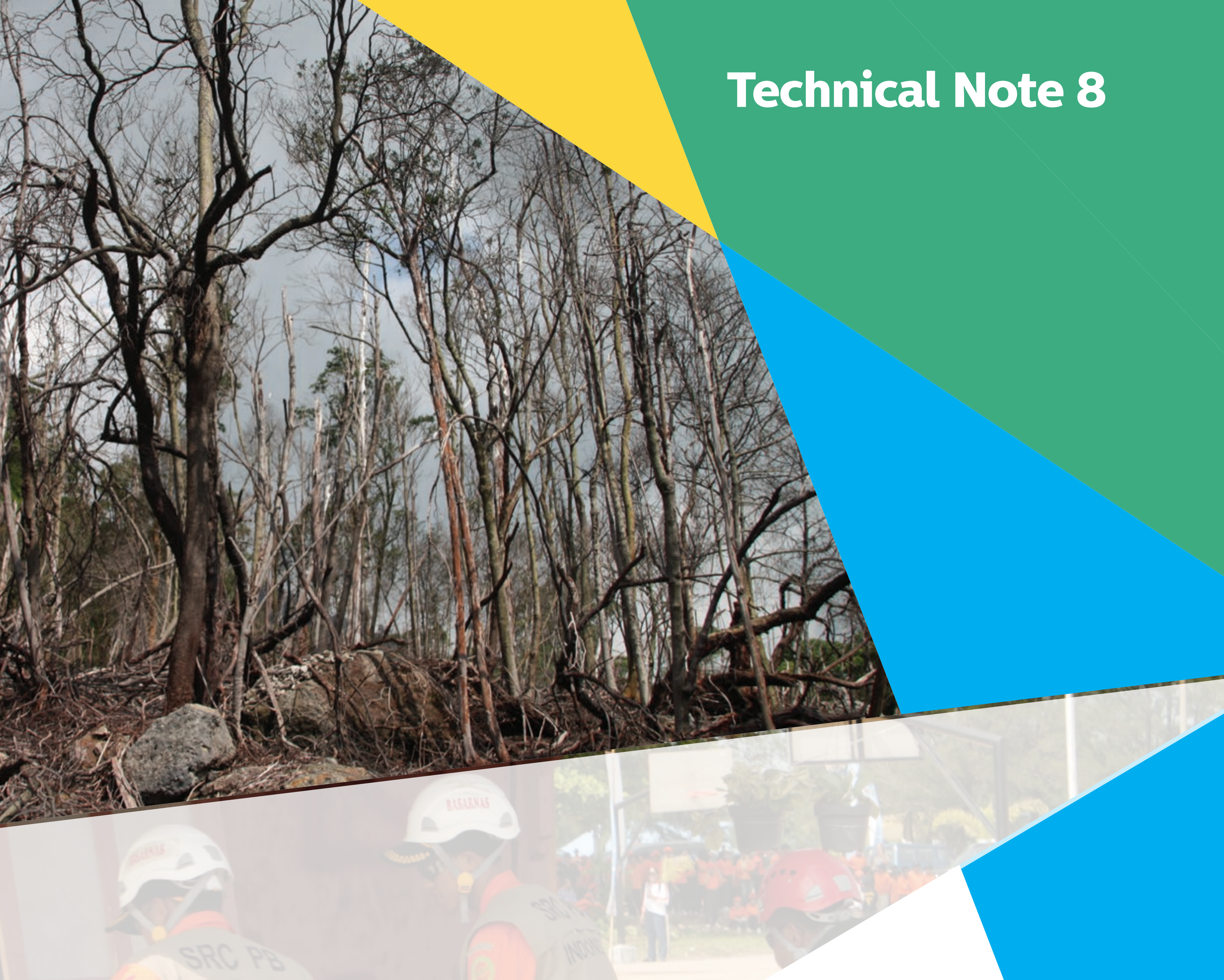
The Rehabilitation and Reconstruction program in Yogyakarta was considered successful, therefore it could be a learning center for disaster management around the world. For that reason, the relocation area has become one of the visit spots for guests from various regions and countries. Some of the study visits to the relocation site are as follows.

- The delegation from the Philippines visited the relocation residence residential and did consultation with the parties involved to get a clear picture related to the process of implementation, including the policy level, implementation and the community-based approach used. This study visit had the purpose to learn good practices in relocation program to be implemented in the rehabilitation and reconstruction of the Haiyan storm, which impacted one million people. Other countries that visited the area were Laos, Gambia, New Zealand, USA, Japan, Timor Leste and the participants of the 5th Asian Ministerial Meeting on Disaster Risk Reduction (AMCDRR) in Yogyakarta.
- At the local level, local governments from other regions studied the implementation of the resettlement of the affected community of the Merapi eruption. The local governments, represented by the Regional Disaster Management Agency (BPBD) from West Sumatra, Aceh, Sinabung and Manado visited the BPBD of Sleman to understand the processes carried out so that the implementation of relocation in their region could occur with high occupancy rate.
- Other parties that visited the relocation sites in Sleman Regency were donors and non-governmental organizations; among others were USAID and Hope International.

Key Messages to Successful Resettlement

Community revitalization with a community-based approach can be done successfully without significant social upheaval and the high occupancy rate could be achieved due to some important factors. The key factors were as follows:

- The certainty of land availability for relocation to the people and the status of the land - including the status of the abandoned land, and access to livelihoods in the new area.
- The capacity of the government to implement the relocation program including coordinating the existing supporting resources.
- The availability of the supporting systems, the qualification of the facilitators, and a system that could develop the capacity of the direct assistance.
- The availability of stimulus funding from the government as core funding for the relocation activities.



Technical Note 8

Knowledge Sharing for Capacity Building of Indonesia's Disaster Risk Management Agencies

WORLD BANK GROUP

GFDRR
Global Facility for Disaster Reduction and Recovery

The World Bank Office Jakarta
Indonesia Stock Exchange Building, Tower II/12-13th Fl.
Jl. Jend. Sudirman Kav.52-53
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Content

Abbreviations and Acronyms

BAKORNAS PB	National Coordination Agency for Disaster Management
BNPB	Badan Nasional Penanggulangan Bencana/National Disaster Management Authority
BNSP	Badan Nasional Sertifikasi Profesi/National Professional Certification Body
BPBD	Badan Penanggulangan Bencana Daerah/Local Agency for Disaster Management
DIBI	Data dan Informasi Bencana Indonesia/Indonesia's Disaster Data and Information
DM	Disaster Management
DRM	Disaster Risk Management
GDLN	Global Development Learning Network
GDP	Gross Domestic Product
INA DRR KC	Indonesia Disaster Risk Reduction Knowledge Center
INA DRTG	Indonesia Disaster Relief Training Ground
INASAFE	Indonesia Scenario Assessment for Emergency
IRBI	Indeks Risiko Bencana Indonesia/Indonesia's Disaster Risk Index
Jakstra	Kebijakan dan Strategi/Policy and Strategy
KE	Knowledge Exchange
KM	Knowledge Management
KMS	Knowledge Management System
KS	Knowledge Sharing
OKS	Organizational Knowledge Sharing
OSM	Open Street Map
Pusdalops	Pusat Pengendalian Operasi/Operation Control Center
REKOMPAK	Rehabilitasi dan Rekonstruksi Masyarakat dan Permukiman Berbasis Komunitas/ Community Based Rehabilitation and Resettlement
RPJMN	Rencana Pembangunan Jangka Menengah Nasional/The National Medium Term Development Plan
RPP	Rencana Pembangunan Permukiman/Community Settlement Plan
VDIC	Vietnam Development Information Center

Chapter 1

THE NEED OF DISASTER KNOWLEDGE MANAGEMENT FOR BUILDINGCAPACITY OF DRM AGENCIES IN INDONESIA

Overview

Indonesia is one of the most disaster-prone countries in the world. The Indonesian archipelago - recognized to be one of the largest in the world - has more than 17,000 islands out of which 6,000 are inhabited. Situated on the Pacific Ring of Fire and at the meeting of the active Indo-Australian plate in the South, the Eurasian plate in the North and the Pacific plate in the East, the country is highly exposed to numerous different hazards and vulnerabilities and have differing levels of disaster response capacity and ability to manage the consequences of crises[1].

17,000 islands
The largest archipelago in the world

34 Provinces
416 Districts
98 Municipalities
7,024 Sub-districts
81,626 Villages/urban villages

81,000 KM coastline
2nd longest in the world

237 million people
4th most populated in the world

129 active volcanoes
1st in the world

Disaster Risk Profile

HAZARDS

Indonesia, being an equatorial tropical archipelago, annually witnesses several hydro-meteorological and climatological hazards. Based on the nationwide disaster risk assessments the Government of Indonesia has listed twelve hazards of national importance as stipulated in the Law Number 24 of 2007 on Disaster Management[2]. Some hazards are natural and man-made, and others are social and human made, and they include:

Natural hazards	Non-natural hazards	Social hazards
earthquake, tsunami, volcanic eruption, flood, drought, typhoon, landslide	technological failure, modernization failure, epidemic and pandemic,	social conflicts between community groups, terrorism

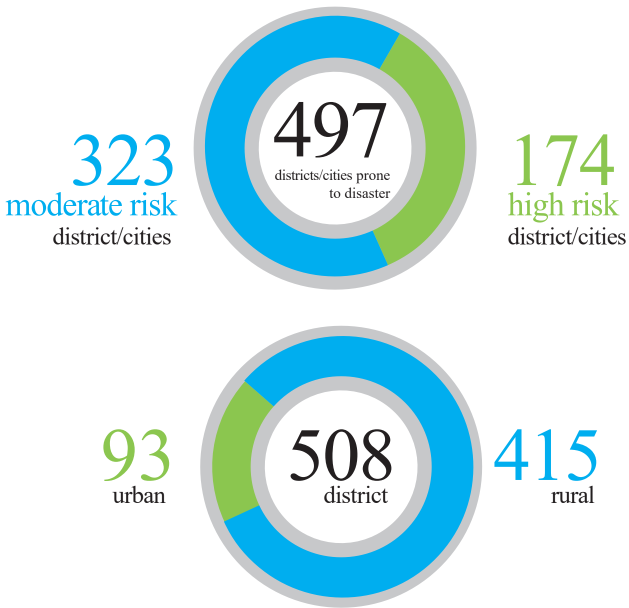
[1] USAID (2014) Indonesia: Disaster Response and Risk Reduction, USAID'S Office of U.S. Foreign Disaster Assistance (USAID/OFDA), 24 October 2014, available at https://www.usaid.gov/sites/default/files/documents/1866/FactSheet_Indonesia_DRRR_2014.pdf

[2] GOI (2007), Law of Republic of Indonesia Number 24, Year 2007 concerning Disaster Management, Government of Indonesia, available at http://www.preventionweb.net/files/10841_indonesialaw242007concerningdisaste.pdf (in English) and http://www.bnpb.go.id/uploads/migration/pubs/1.pdf (in Indonesian)

Figure 1 Disaster Risk Index Map of Indonesia, 2013

VULNERABILITY AND RISK

The National Disaster Management Authority (BNPB)'s Indonesia Disaster Risk Index or (*Indeks Risiko Bencana Indonesia*/IRBI) of 2013 indicates that out of the total 508 districts (415 rural and 93 urban), 497 districts/cities have been listed as prone to disaster, out of which 323 districts/cities (65%) have been identified as "high risk" and 174 (35%) as "moderate risk" districts. In addition to inheriting post-colonial poorly consructed school facilities, inadequate health services, poverty and regional inequalities, these districts also undergo rapid but unplanned urbanization and population growth and environmental degradation. Coupled with the effect of climate change communities living in the districts and municipalities are increasingly exposed to new hazards, aggravating the already existing vulnerabilities. Among the most vulnerable population are the elderly, children, women (especially pregnant and lactating women), and persons with disability.

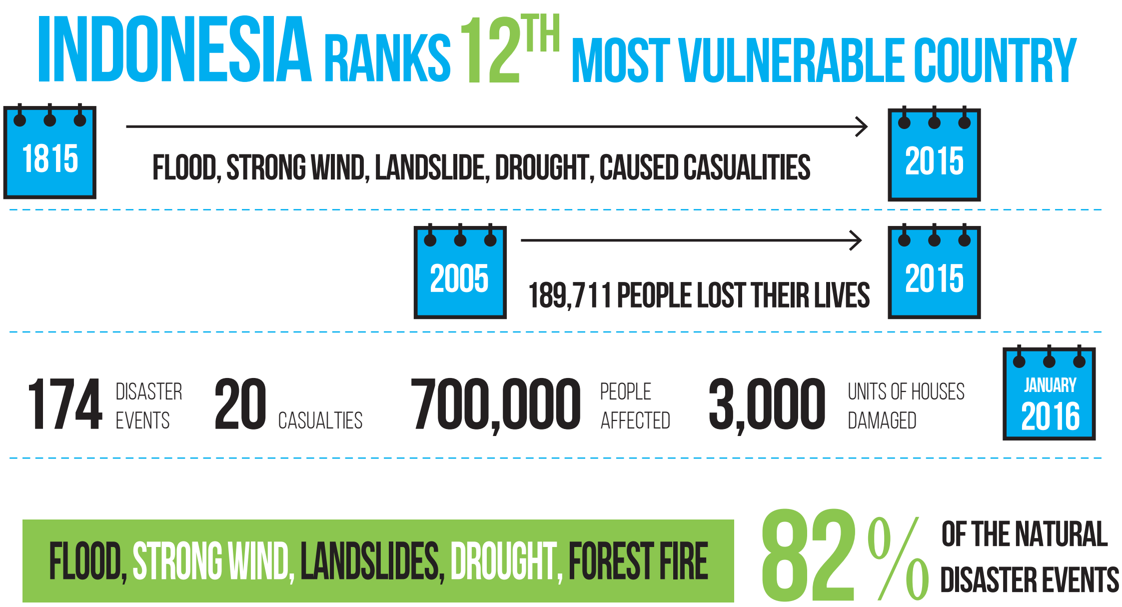


Source: IRBI BNPB, 2013

Figure 2. Flood in one of the main road in North Jakarta, 2013

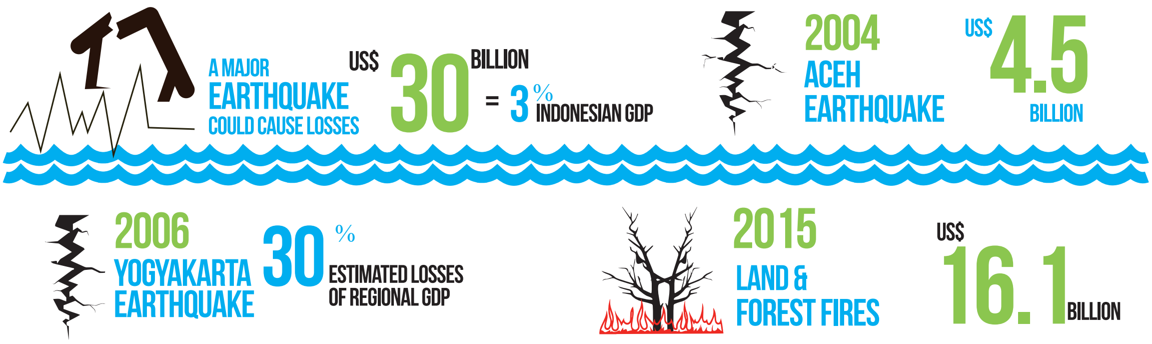
DISASTER LOSS AND MORTALITY

In terms of disaster losses, Indonesia ranks 12th among the most vulnerable countries with high mortality risk from multiple hazards[3]. According to Indonesia's Disaster Data and Information (DIBI), floods followed by strong winds, landslides and droughts killed the largest number of people in Indonesia between 1815 and 2015. During the period of 2005 and 2015 alone, some 189,711 people lost their lives due to natural disasters. Hydrometeorological disasters such as flood, strong wind, landslide and forest fires accounts for 82 % of the natural disaster events in the country. DIBI's most recent data recorded that in January 2016 alone, 174 hazard events claiming 20 lives, with around 700,000 people affected and/or displaced and almost 3000 units of houses damaged from these events[4].



[3] World Bank and UNISDR (2009) Disaster Risk Management Programs for Priority Countries Summary http://www.unisdr.org/files/14757_6thCGCountryProgramSummaries1.pdf
[4] www.dibi.bnpb.go.id

DISASTER HAS A LARGER ECONOMIC IMPACT



DISASTER ECONOMIC LOSS IN RELATION TO GDP

A report by the World Bank and GFDRR shows that while the annual economic impact of natural disasters is estimated at 0.3% of Gross Domestic Product (GDP) over 2000-2010, with simulations show that a major earthquake (which occur once in 250 years) could cause losses in excess of US$30 billion or 3% of GDP of Indonesia. It is evident that disasters have a larger economic impact at local and sub-national levels. The 2004 earthquake in the province of Aceh, for instance, was estimated to lead to economic impact of US$4.5 billion (i.e. 1% of national GDP), which represents 54% of the province's GDP. Likewise, the 2006 earthquake in the province of Yogyakarta caused losses estimated at 30% of the regional GDP[5]. The World Bank also recently estimated that major land and fores fires which occurred in 2015 alongside a string El Nino had cost Indonesia at least IDR 221 trillion (USD 16.1 billion), equivalent to 1.9% of 2015 GDP, and more than twice the reconstruction cost after the Aceh tsunami[6].

DIBI has also recorded that overtime, cumulative impacts from small and recurrent disasters can also equal or even exceed those from larger catastrophes, thus exacerbating economic loss, reinforcing poverty and compounding the hardship that poor communities have endured, especially when disaster events lead to damage and loss of public infrastructure and facilities. The loss of private assets, mostly housing, also contributes to significant and consistent ranking in damage and loss assessment reports. These stagerring figures highlights the importance of managing Indonesia's disaster and climate risks if the country were to protect its hard fought development gains.

Figure 3. The SAR Team operation during the landslide in Banjarnegara, Central Java, 2015.

[5] The World Bank & GFDRR, "Indonesia: Advancing a National Disaster Risk Financing Strategy – Options for Consideration," available at http://siteresources.worldbank.org/EXTDISASTER/Resources/Indonesia_DRFI_Report_FINAL.pdf

[6] World Bank (2015) Indonesia Economic Quarterly, Reforming amid uncertainty http://pubdocs.worldbank.org/pubdocs/publicdoc/2015/12/844171450085661051/IEQ-DEC-2015-ENG.pdf

UNDERSTANDING RISK: NATIONAL COMMITMENT

The National Medium Term Development Plan (RPJMN) for 2015-2019 had identified 136 most vulnerable districts/municipalities that will experience rapid development, and targeting the reduction of disaster risk index in these regions by at least 20% by 2019, including through contribution of knowledge sharing in disaster management and disaster risk reduction. A detailed policy and strategy (*Jakstra*) on disaster management to achieve such target has been issued by the BNPB in April 2016, which is based on the national medium term development plan (RPJMN) of 2015-2019, the National Plan for Disaster Management 2015-2019, and Sendai Framework for Disaster Risk Reduction 2015 - 2030.[7] The Jakstra will become the guideline for a coordinated, integrated and targeted conduct of disaster management as mandated by Article 4 of the Disaster Management Law 24 year 2007.

The RPJMN[8] outlined strategies that includes:

a. To internalize disaster risk reduction in national and local development planning
b. To reduce community's vulnerability to disaster
c. To improve the capacity of governments at the national and local levels and community in disaster management.

Figure 4. A densely settlement along the riverbanks in Malang, East Java.

[7] Kepala BNPB Tandatangani Dokumen Kebijakan dan Strategi Penanggulangan Bencana 2015 – 2019, 22 April 2016", see http://www.bnpb.go.id/berita/2910/kepala-bnpb-tandatangani-dokumen-kebijakan-dan-strategi-penanggulangan-bencana-2015-2019

[8] GOI, 2015, National Medium-Term Development Planning (RPJMN) 2015-2019, available at http://www.bappenas.go.id/index.php?cID=5009

Disaster Risk Management (DRM) Agencies in Indonesia

The enactment of the Disaster Management Law Number 24 year 2007 post the Aceh Tsunami marked a significant step in the strengthening of national disaster management capacity. As mandated by the Law, a new legal structure called the National Disaster Management Authority (BNPB) was established with responsibility to coordinate and manage the conduct of disaster management, substituting the previous policy coordination body called the BAKORNAS-PB.[9] BNPB main tasks are to formulate policy, prepare guidelines, and coordinate activities related to disaster management; **share disaster management knowledge** with the public; sets national standards for disaster management; manages and coordinate national and international assistance related to post disaster recovery.

The key differences between BAKORNAS and BNPB are that, while the former was known only as having ad-hoc inter-ministerial status, the latter is a larger organization with full agency status, headed by a Cabinet Minister level official reporting directly to thePresident. In an emergency phase, the BNPB has the authority to direct line ministries, and is independently resourced including to support other ministries, sub-national governments, and non government actors. BNPB is also mandated to coordinate the line ministries in implementing preventative measures and leading recovery from the impact of disasters. The new law and related DM structures demonstrate a commitment from the Indonesian government and the parliamentarians to change the way DRM conduct was done and creates a genuine opportunity to make disaster risk management as collective responsibilities of many actors, but with strong coordination and resources to facilitate timely actions.

Figure 5. The main office of Indonesian National Disaster Management Authority (BNPB) in Jakarta.

Photo Credit: Pusdatin BNPB

[9] BAKORNAS, National Coordinating Agency for Disaster Management
[10] This is based on the data at the time of this Note preparation in May 2016.

As Indonesia is highly decentralized, the organizational structure of the BNPB is also replicated at the provincial and district/municipal levels. There are currently[10] 34 provincial level disaster management agency called the Provincial BPBDs, and 342 Local DM Agencies at district and municipal levels called the district or municipal BPBDs. Under the decentralized principles, the BPBDs are the instrument of sub-national governments (i.e., established through by law of the respective administration). The same principles also transfer both administrative and fiscal responsibilities from the national to provincial and district/municipal governments, including in terms of BPBDs management, financing and operations.

Challenges in Building Disaster Risk Management (DRM) Capacities

With a backdrop of its multi-hazards, risk and vulnerabilities, geographic size and archipelagic nature, compounded by the complex administrative and fiscal decentralization, managing Indonesia disaster and building competent DRM institution is a daunting challenge. Even the same types of disaster may have different impacts, different solutions, different responses and different characteristics due to locations, cultures, preparedness, and local knowledge. Recent examples of major disasters of similar type but with different characteristics, impacts and responses in Indonesia include the violent eruption of Mt. Merapi in Central Java in October-November 2010 killing many people, continued eruptions of Mt. Sinabung since 2013 hampering local livelihood, and brief eruption of Mt. Kelud in February 2014 forcing closures of 8 airports. The challenge for Indonesia's DRM agencies is to learn from every disaster of today for better and more effective response and recovery in the next one.

In addition, as BNPB and the BPBDs are relatively new institutions with new legal structure, shifting the culture from response to risk reduction, especially at the local level some located in remote islands, building a capacity to deliver consistent services will require serious investment and innovation in human resources, infrastructure and organizational processes.

Figure 6. The Rapid Response Team during the Disaster Drill in Bengkulu.

[11] World Bank. "Indonesia: Strengthening Knowledge Sharing Capacity of the National Agency for Disaster Management." Aide-Memoire of World Bank Mission, June 11-19, 2013

GENERAL INSTITUTIONAL CHALLENGE

DM agencies at the national and local level have to cover at least 12 main types of hazards and multi-hazards occurrences and recurrences with differing levels of disaster response capacity and ability to manage the consequences of crises at the local level. With a high frequency of occurrences of more than 1,500 incidents per year (or approximately 4.3 events per day), BNPB and BPBDs must manage and coordinate collaboration among many stakeholders from government (central & regional levels, armed forces, national police), private sector (equipment suppliers, the media), general public (NGOs & CSOs, universities, community), which is a very huge task. Under decentralization BNPB does not have a direct authority over BPBDs. But as Indonesia is also a unitary state, a general lack of local capacity and resources means that local disasters may eventually become a National Government problem.

12 TYPES OF HAZARD

1500 INCIDENT PER YEAR

4,3 EVENTS PER DAY

400 BPBD OFFICES

+/- 20 STAFF IN EACH OFFICE

Source: World Bank estimation, 2016

Figure 7. Mount Semeru Community Preparedness and Drill, East Java.

BNPB therefore continues to invest in building the technical capacity and resources of these BPBDs. Many innovative approaches are being invented to enable capacity and resources to be able to timely flow to the disaster areas regardless whether disaster management is administratively and fiscally decentralized or not. As building local resilience takes time, delay in disaster response and recovery assistance means that the affected population will be denied the proper care and services that they are entitled to.

But, building institutional capacity is a long process. As an illustration, to provide training to each of the existing 400 provincial and district BPBDs, there is no enough day in a year. On the other hand, managing a mass training for more than 8,000 BPBD personnel (assuming each BPBD has 20 staffs and volunteers), will require large centralized training facilities and air travel. This illustrates that building the capacity of Indonesia's DRM agencies cannot be done through traditional training approach.

CHALLENGES IN KNOWLEDGE MANAGEMENT/EXCHANGE

Findings of a joint mission carried out in 2013 by the World Bank Institute, the East Asia and Pacific Sustainable Development unit and BNPB determined that there are strong potential linkages and synergies between BNPB's internal knowledge management with its knowledge sharing activities at domestic and international levels. The mission also identified capacity challenges needs at all three levels – internal, domestic, and international[11]:

- **Within BNPB**, knowledge management and sharing is hampered by limited mechanisms and procedural obstacles in internal communications and sharing of practical experiences, lack of systematic documentation and sharing of BNPB's operational experience, insufficient use of IT systems to capture and disseminate knowledge, significant loss of institutional memory through high turnover of BNPB managers, and insufficient training of new managers and staff due to their heavy daily administrative and operational duties.
- **Knowledge sharing at the domestic level** between BNPB 400 provincial and local disaster risk management agencies (BPBDs) and among the BPBDs is limited as there is insufficient capture of the lessons learned in the implementation of DRM regulations and guidelines, BNPB currently cannot meet the high training needs of the local BPBDs, domestic knowledge sharing between BNBP and BPBDs and among BPBDs is often ad hoc and not systematic, and DRM experiences in other line ministries and agencies are not captured.
- Finally, **BNPB's knowledge sharing at the international level** is restricted by insufficient clarity on the objective for international knowledge sharing and the responsibilities for managing those activities, unclear lack of strategic selection and validation of Indonesia's DRM experiences worth sharing, limited cataloging of Indonesian DRM experiences for sharing, limited awareness and understanding of results-orientation and possible instruments for knowledge sharing, and insufficient overview of financial resources for international knowledge sharing activities.

Through the joint mission, BNPB leadership was aware of many of these lacks of capacity and needs for improvement. Since 2013, the World Bank's assistance for strengthening capacity in knowledge sharing in disaster management addressed the three levels of need at the internal, national and international as previously outlined.


PETZL
ERG

Chapter 2

KNOWLEDGE AS THE SOLUTION TO BUILDING THE CAPACITY OF DRM AGENCIES

Why Knowledge is important for DRM Agencies

Knowledge exchange is the process of peer-to-peer learning for sharing, transferring, and enhancing a successful result in the development process. In knowledge exchange, development practitioners learn the practical knowledge from those who have had the experience or are in the progress of experiencing them. In this knowledge exchange, it is important to be connected and to have prompt access to practical knowledge and solutions.

The World Bank has a number of working definitions around knowledge. One definition coined during Technical Coordination Meeting for Training and Education in Disaster Management defines **knowledge management** (KM) as a series of tools, techniques, and strategies for retaining, analysing, organizing, enhancing and distributing knowledge and operational experiences of an organization. KM focuses on finding ways to transfer raw data into useful forms of information that will eventually be transformed into knowledge. Meanwhile **knowledge sharing** (KS) is the process by which individuals collectively and iteratively refines thoughts, ideas or suggestions in the light of experience or the process of developing, transferring, integrating, and using knowledge effectively and efficiently. For the purpose of this document, the last definition by the World Bank is used.

Although there are a number of disciplines and sectors whose works are characterized by constant discovery of issues, challenges and solutions, Disaster Risk Management, especially in Indonesia, stands out as one that is most compelling. First, although sometimes predictable, disasters always have unexpected elements and each event is unique. Disaster

Figure 8. Knowledge exchange visit of the Indonesian DRM agencies to the Korean National Disaster Management Institute (NDMI) in South Korea, June 2016.

Figure 8. A workshop on knowledge management held by the BNPB's Center for Training and Education (Pusdiklat).

management profession is always faced by the challenge of having to quickly learn on-the-job. For Indonesia, in particular, disaster occurs so frequently and in many different locations in that the window of opportunity to learn from one event is so short, before the next one comes. This is where knowledge capture, storage and sharing become very important.

In view of the challenges faced by DRM agencies in Indonesia as outlined above, in 2013 the World Bank supported Government of Indonesia through BNPB a pilot program for strengthening the capacity of BNPB and the BPBDs to capture and share its experiences on disaster risk management across the country. The objective was to foster domestic retention and scale up of DRM knowledge and expertise, use the knowledge to improve operational effectiveness in managing disaster risks in Indonesia, and to share the DRM knowledge internationally.

How Knowledge is Captured and Documented

With various operational practices from pre disaster, during disaster, and post disaster, the knowledge and experiences can be captured, documented, and packaged into manual, module or guidelines. A case that contains a specific experience, how the situation or disaster was managed, the challenges, lessons learned, solutions and actions taken is called a knowledge asset. Knowledge assets which are based on actual operational experiences can help policy makers faces the same situation in other locations make critical decisions. Knowledge assets ideally should be pooled in a (digital) library and accessible for all staffs, which in this case are those of BNPB and BPBDs. A digital library containing these knowledge assets can be the fastest way to get practical information on how to manage

REKOMPAK
COMMUNITY SETTLEMENT PLAN

USD 2.6 MILLION FOR HOUSING
USD 450,000 FOR SETTLEMENT INFRASTRUCTURE

MAGELANG	SLEMAN	SLEMAN, KLATEN, MAGELANG, BOYOLALI
106 VILLAGES	**312** BASIC INFRASTRUCTURE	**106** VILLAGES
476 UNITS OF HOUSES	**2,040** UNITS OF HOUSES	**1,145** BASIC INFRASTRUCTURE

disaster, good resources for research, good resources for training, and not limited to organizational learning prosess. Learning from experiences would help to a better delivery or service in disaster management.

The case of relocating community living in a risk area of Mount Merapi, one of the most active volcanoes in Indonesia, is a good example of how knowledge assets can be transferred to solve problems with similar situations. The Mount Merapi erupted in 2010 and left hundreds of casualties, damaged houses and livelihood, and left thousands of people evacuated. The local government issued a map of risk area prohibiting communities to live in the risk zones. By using a Community Based Rehabilitation and Resettlement of

Figure 9. The house built by local community after the Merapi eruption in Yogyakarta.

Communities (REKOMPAK) approach, local governments convinced the community to understand the risk of living in their previous settlement and it has led to a voluntarily relocation.

The REKOMPAK has developed a Community Settlement Plan (RPP) for 106 villages and built 476 units of houses in Magelang district, Central Java and 2,040 units in Sleman district with 312 basic infrastructure activity points, including infrastructure for disaster risk reduction. REKOMPAK has also facilitated the development of 1,145 basic infrastructure activity points in 106 villages affected by the eruption and lahar flows in the districts of Sleman, Klaten, Magelang and Boyolali. REKOMPAK had also been able to bring back the value of collective work that has been the social characteristic and strength of the community, resulting in a value equal with IDR 5.7 billion (USD 450,000) for settlement infrastructure and IDR 22.2 billion (USD 2.6 million) for housing through collective work. The best practice in Mount Merapi could be a good example for other local governemnt to apply the same approach to relocate community affected by other volcano eruption, such Mount Sinabung, North Sumatra in 2013. The challenge, however, is to identify and transfer the appropriate level of knowledge that can be applied in Sinabung.

How Knowledge is Shared and Transferred

The experiences that are relevant for disaster management effectiveness usually are made by actors, players, policy makers. During pre-disaster, officials at BNPB or BPBD levels often do not think of how the lessons and experiences can be shared with staffs. Their experiences or tacit knowledge are often forgotten or lost wihout being documented.

Figure 10. BNPB's Emergency Operation Center (Pusdalops) during the visit from the World Bank delegation.

Following the Art of Knowledge Exchange by the World Bank Institute (2013), different ways of sharing knowledge could be applied to implement knowledge sharing activities between BNPB and BPBD. For example, BNPB holds a coordination meeting every year with all BPBDs in Indonesia. Experts from ministerial level, leaders at provincial and distric level, from government and non-government, gather and share the experiences and practices in managing local disaster.

From the capacity strengthening initiative in knowledge exchange, the benefit for BNPB and BPBD by applying knowledge exchange is reflected in the following table.

SCOPE	BENEFIT
Increasing awareness and trust on the importance of learning from direct experience ("seeing is believing").	Knowledge Exchange (KE) can build the culture of experience exchange with different people, regions, or countries with the hope to improve the quality of DRM agencies' operational practices in disaster management
Strengthening organisation's policies and governance in managing knowledge	▪ KE can reduce the time needed for formal learning ▪ KE can serve as one of the ways to retain knowledge and experience in the community of knowledge
Building skills and capacity in how to capture, document & package, and share knowledge	▪ KE can identify new innovative and interactive practices in DM ▪ KE can create appropriate pattern for the mechanism of information presentation or knowledge management ▪ KE can improve performance in DM through the rapid provision of practical guidelines and field experience

Figure 11. The Chief of BNPB as a speaker during the Third High-Level Meeting on Country-led Knowledge Sharing in Washington D.C., 2016.

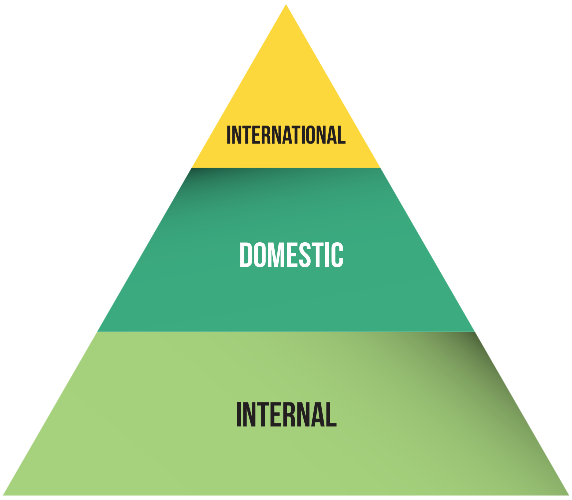
Volcano Merapi

Chapter 3

THE DEVELOPMENT OF KNOWLEDGE MANAGEMENT CAPACITY AT BNPB AND BPBDS

Together with the initiatives and modalities that the Indonesian DRM agencies have made available, the World Bank has carried out the following activities in the Capacity Strengthening for Knowledge Sharing program during 2013-2015.

Figure 2 Knowledge sharing capacity pyramid



Visioning Knowledge Based DRM Agency

A visioning workshop was held in September 2013 involving 20 middle and senior managers (Echelon 1 and 2) of the BNPB to initiate the development of a Knowledge Sharing policy framework document. Senior managers agreed to aim for a vision in which "BNPB is a center of excellence for DM in Indonesia, the region and globally, and an efficient knowledge sharing institution providing innovative and effective DM solutions." Using a knowledge sharing capacity pyramid, the visioning wokshop became a reference for BNPB senior managers to establish a task force and set up a good communication framework between leaders to staffs and partners.

Table below shows the objectives and the expected results that BNPB wanted to achieve as a result of the visioning workshop.

LEVEL	OBJECTIVE	EXPECTED RESULTS
International	Develop Indonesia as a Knowledge Hub on DM	Knowledge capture Documentation of skills and knowledge on knowledge and experience through the creation of archive and database systems; standard templates or formats for reporting and presentation; effective simple procedures
Domestic	Foster the sharing of good practice on DM across Indonesia to make DM efforts more effective; enhance learning mechanisms and trainings on DM, based on local evidence	Knowledge documentation and packaging ▪ Skills and knowledge on knowledge products or other learning materials such as leaflets, brochures, fact sheet, work procedures, videos of operational field experience accessible to BPBDs and other agencies ▪ Innovative and interactive capacity building activities, such as case studies or exchange visits to disaster areas
Internal	Improve BNPB's and BPBDs internal processes to more effectively build and retain DM capacity	Knowledge sharing ▪ Skills and knowledge on how to package Indonesian experience to become generic knowledge for use by other countries ▪ Exchange of experience in Indonesia in international forums ▪ Use of InaDRTG as a knowledge Hub in DRM, at least in Asia Pacific region

Provision of Legal and Institutional Framework

Through a knowledge sharing policy and governance workshop involving BNPB senior managers, **a national policy on knowledge management for disaster management** was issued as a Regulation of the Head of BNPB (*Perka*) Number 21 year 2014 and a subsequent Inter-Deputy Working Group was established. This regulation became the basis for setting up key principles, knowledge sharing activities, and implementation guidelines for actors active in disaster management in Indonesia. The regulation stipulates the main role of the INA DRTG (see below) as the centre of knowledge and experience in disaster management to facilitate knowledge sharing not only internally within the DM agencies, but also nationally and internationally.

A working group or Task force consisting of each unit in BNPB was tasked to share data, information, operational practices and experiences, as well as to evaluate, review, and provide inputs of BNPB's knowledge products.

Capacity Building in Knowledge Capture

THE ART OF KNOWLEDGE EXCHANGE

The "Art of Knowledge" training was held for BNPB senior and mid management officials, their staffs, and selected partners in April 2014 to develop BNPB's internal capacity to systematically design and implement knowledge sharing activities domestically and internationally. The training provided the methodological underpinning for result-oriented knowledge sharing, and resulted in the development of several tools to allow for more results-oriented planning, delivery and follow-up of knowledge sharing activities on DM in Indonesia through a DM Solutions Finder System. In addition, the Art of Knowledge Exchange guide has subsequently been translated to Indonesian for more extensive use.

Figure 12. BNPB's Prime Secretary on his opening remarks at the Knowledge Sharing Policy and Governance Workshop.

THE ART OF KNOWLEDGE CAPTURING AND PACKAGING

A 3-day workshop on knowledge capturing and packaging of operational experiences was held from March 26-28 at Gadjah Mada University (UGM) in Yogyakarta. The workshop brought together 45 participants from UGM, the local BPBD and BNPB staff and management from Jakarta. The Art of Knowledge Capturing and Packaging developed the capacity for systematic capturing and documentation of operational lessons learned from disaster management, that included how to document tacit lessons learned from actual stakeholders involved in incidents.

TOT OF THE ART OF KNOWLEDGE CAPTURING AND PACKAGING

To scale up the standardized methodology on systematically capturing lessons learned from actual operational experiences on disaster management in Indonesia, a Training of Trainers (TOT) was held in September 2014

2014 - 2015

14	BASIC TRAINING SESSIONS AND TRAINING-OF-TRAINERS
350	PARTICIPANTS FROM BNPB, BPBDS, NGOS, AND UNIVERSITIES
70	KNOWLEDGE ASSETS
2	KNOWLEDGE CAPTURING MODULES
+10	MASTER TRAINERS

and produced a core body of 6 initial trainers. Subsequently several trainings were offered to district-level disaster management agencies (BPBDs) and resulted in the development of the first completed knowledge assets. The main objective of the TOT was to create a first cadre of trainers who will scale up the delivery of knowledge capturing skills and methodologies across BNPB. The outcome of the TOT was an initial group of “knowledge

Figure 13. The practice of Knowledge Capture with local students and BPBDs in Yogyakarta.

capturing" specialists who were equipped with a methodology, technical video recording skills, and pedagogical tips to train others on knowledge capturing.

In 2014-2015, BNPB has already conducted 14 basic training sessions and Training-of-Trainers involving 350 participants from BNPB, BPBDs, NGOs, and universities; has 70 Knowledge Assets from a variety of disaster management experiences in Indonesia; 2 modules on Knowledge Capturing processes for facilitators and participants; +10 master trainers; and a Knowledge Management System (KMS)/ Solution Finder Apps.

DISTANCE LEARNING AND BLENDED LEARNING TRAINING

A Distance Learning and Blended Learning training was provided for BNPB in July 2014 at the INA-DRTG. This includes an analysis of current capacities and development of a skills matrix to strengthen existing staff, as well as strengthening the team in selected positions. In addition, support included training on distance learning methodologies and technology such as video conferencing and e-learning.

As a follow up, the INA-DRTG conducted a study visit to Vietnam Development Information Center (VDIC), facilitated by DRM Unit of the World Bank Office Jakarta. 4 staffs from INA-DRTG learned about: 1) VDIC's facility and its management experience as a distance learning facility; 2) VDIC's experience in managing blended learning activities using video conferencing technology; 3) planning, designing, and implementing distance learning activities in VDIC; 4) building capacity for local disaster management agencies in Vietnam, including managing knowledge sharing activities between Disaster Management Centers (DMC) at national and local levels; 5) organizing and conducting a video conference in real time by connecting with several sites, observing the learning process, and managing technical problems.

Figure 14. BNPB hosted the session of a Global Development Learning Network.

Try out of Knowledge Sharing

In line with knowledge sharing supports, World Bank – GFDRR have also supported a range of domestic and international knowledge sharing activities.

- *Learning from Community of Practice in Disaster Management.*
  WB-GFDRR together with AIFDR developed the INASAFE tool to help local and national DRM agencies in improving preparedness and disaster risk reduction. In June 2013, BNPB became the host for a meeting session with Global Development Learning Network (GDLN), in which GDLN Tokyo was the hub. It was BNPB's first experience to become the host for a GDLN session, connecting 4 countries: Indonesia, the Philippines, Mongolia, and Srilanka. BNPB shared its knowledge on how participatory mapping has been used by the Government of Indonesia in contingency planning and Damage and Loss Assessment working with the OpenStreetMap (OSM) tools and community, and how the data was integrated into the national database.

- *Learning from flood preparedness from the DRM Agency of DKI Jakarta*
  With the World Bank facilitation, a number of countries have come to Indonesia to learn about the community of practice in flood preparedness in Greater Jakarta (DKI Jakarta) province from the local DRM agency (BPBD).

- *Learning from flood collaborative mapping in post Merapi eruption*
  The experience of the collaborative mapping in post Merapi eruption areas has been used and adapted in the Slum Resettlement Program of the Ministry of Public Works and Settlement.

Figure 15. A visit of the Government of Gambia delegation to the AHA Center in Jakarta.

- *Learning from Emergency Response in Indonesia*
  The government of Mongolia, the Philippines, and Lao PDR made an exchange visit to Indonesia to learn from BNPB about their emergency response regulation and facilities.

- *Learning from Post Disaster Rehabilitation and Reconstruction*
  WB-GFDRR facilitated countries in the regional level up to Africa to learn from BNPB about post-disaster rehabilitation and reconstruction. Countries like Timor Leste, Lao PDR, Gambia, Mongolia, and the Philippines learned directly how affected communities rebuild their houses and self-reliantly relocated to safer places. The Government of Mongolia, during the visit in 2014, was in the progress of reviewing their law on disaster management, and had sent their disaster management agency, NEMA, to learn from BNPB about emergency response and coordination between ministries and institutions, including legal aspects in disaster management.

BNPB's Modalities and Good Practices to Support the Initiative in Knowledge Exchange/Sharing

Both the Government of Indonesia and BNPB are determined to both foster domestic retention and scale up of its DM expertise, as well as to share its DM knowledge internationally. A number of modalities, initiatives, and good practices exist partly as a result of the technical assistance provided by the World Bank that show the commitment of the Government and BNPB as well as government institutions for disaster management related in meeting the vision to become the centre of excellence on disaster management in Indonesia, the region, and globally, and an efficient knowledge sharing institution providing innovative and effective disaster management solutions:

BNPB established the Indonesia-Disaster Relief Training Ground (INA-DRTG) and Indonesia Disaster Risk Reduction Knowledge Center (INA DRR KC). The INA-DRTG serves as the

Figure 16. Two government officials from the government of Mongolia during their visit to BNPB.

Headquarters and Secretariat of the Disaster Management Rapid Response Unit, centre for disaster information and monitoring and assessment of disaster risks, backup operation control centre (Pusdalops), and centre for training and simulation of the Pusdalops, and international disaster management training academy.

At the same time INA DRR KC has continually been the centre for knowledge collection (disaster histories, indigenous wisdom, past researches), knowledge exploration (research, assessments), and prediction for early warning. Both the INA-DRTG and the INA DRR KC are some of the major steps in achieving BNPB's vision as a centre of excellence in disaster management both nationally and internationally.

The facilities have been used accordingly, evidence of how knowledge sharing can be conducted at low cost without face-to-face meeting, by President Jokowi who held a video Conference in November 2014 to get first account of the situation of internally displaced people affected by Sinabung eruption and flood in West Aceh. The Head of BNPB, Minister of Social Affairs, and Minister of Bappenas were also present during the video conference.

Knowledge exchange or peer-to-peer learning, is an effective way to share, transfer, and expand successful experience in development. Development practitioners are keen to learn practical experiences from those who have had the experience or are having similar experience. People need to be connected with each other and have easy and quick access to knowledge and practical solutions, including in disaster risk management.

BNPB's mandate states that it needs to collaborate with partners and local DRM agencies (BPBDs) to ensure effective and live saving execution of disaster management. Local mechanisms, including knowledge sharing, are crucial in ensuring this success.

No single disaster is alike. Even the same types of disaster may have different impacts, different solutions, different responses and characteristics due to locations, cultures, preparedness, and local knowledge. Each incident is a singular learning experience. The following three cases of volcano eruption response and management in three volcano hazard areas show that learning from each individual at post-crises stage is important to be able to provide effective and live saving responses to future crises and disaster risk reduction efforts.

Figure 17. Indonesia's Disaster Relief Training Ground in Sentul, West Java.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Chapter 4
NEXT STEP AND LESSONS LEARNED

Building Organizational Knowledge Sharing (OKS)

With the systematic development of knowledge management capacity at the BNPB and BPBDs from visioning, to planning, capacity building, and initial piloting, there is now an opportunity to scale up and integrate the process as part of institutionalizing the knowledge practices. The main goal of developing Organizational Knowledge Sharing (OKS) is to infuse within the DNA of the organization the institutional character that will put knowledge as the default operational requirement of the organization. The OKS engagement with BNPB is a needs-based and interest-based capacity building process that involves internal and external audiences, and has taken place at internal and domestic levels. The phases of OKS covers the 8 pillars of Knowledge Sharing Capability Framework that should be adapted in scope, scale, and timeframe based on ongoing activities and work plan of BNPB, executed based on the challenges identified and vision established at the initial stage of the engagement that frames the OKS process. In an OKS engagement, BNPB should embed knowledge sharing in its own organizational culture and knowledge sharing behaviors as second nature that are integrated into daily operations, internally within the organization and replicated to regional organizations such as BPBDs or immediate stakeholders such as universities and NGOs.

As the first phase of support had been provided to introduce the Art of Knowledge Exchange with various processes from capturing to packaging, storing and to delivery. A number of trainers and facilitators have been trained in the knowledge management process and knowledge sharing mechanisms throughout the engagement, equipped with tools to disseminate the process and replicate results. The knowledge assets that have been produced as knowledge products and the trainers and facilitators are organizational assets of BNPB to scale-up its knowledge sharing operations, making them integral within the organization, provide innovative add-ons to their existing learning programs, and securing the collection of documented knowledge within the organization. Through making knowledge as part of the basic requirement for BNPB officers to operate, regular capacity building program

Figure 17. BNPB's Emergency Operation Center on a daily activity.

and resources that the organization have allocated can now be utilized to adopt the new tools and methodology, and gradually apply them in the conduct of capacity building of institutions and personnel involved in DRM in Indonesia. Such an organizational scale of the knowledge management practice will ensure that Indonesia's DRM practice will gradually move from operation and response- based to knowledge and planning based. This approach will be fully in line with the basic philosophy of Law 24/2007 on Disaster Management from re-active to preventive. Results of the OKS efforts could in turn be shared to other countries to secure Indonesia's aim as a knowledge hub on DRM.

Toward Building Professional Track for DRM Practitioner

As part of the effort to professionalize DRM expertise, there are two tracks of recognition that DRM practitioners could pursue. For general practitioners outside within and outside the government, a recognition system through professional certification is being developed by an independent committee accredited by the National Professional Certification Body (BNSP). The committee's primary role is to facilitate a process of assessing the professional qualification of an individual who have fulfilled a specific minimum requirement to receive a particular level of proficiency. At present, the certification process for DRM professional is still under development and will gradually provide recognition for 3 levels of expertise: operator, analyst, and expert. Within each level, there are 3 grades: entry, junior, and senior.

A similar professional recognition system can also be found within the Indonesian civil service career system, called the functional track. Many areas of professions such as lecturers, medical workers, or researchers have had functional career track ladders developed for civil servants. Each professional area usually has a national government agency serving as its lead (e.g., the development of researcher functional career is lead by the Indonesian Science Institute).

Figure 18. The practice of knowledge capturing with the Jakarta province Disaster Management Agency.

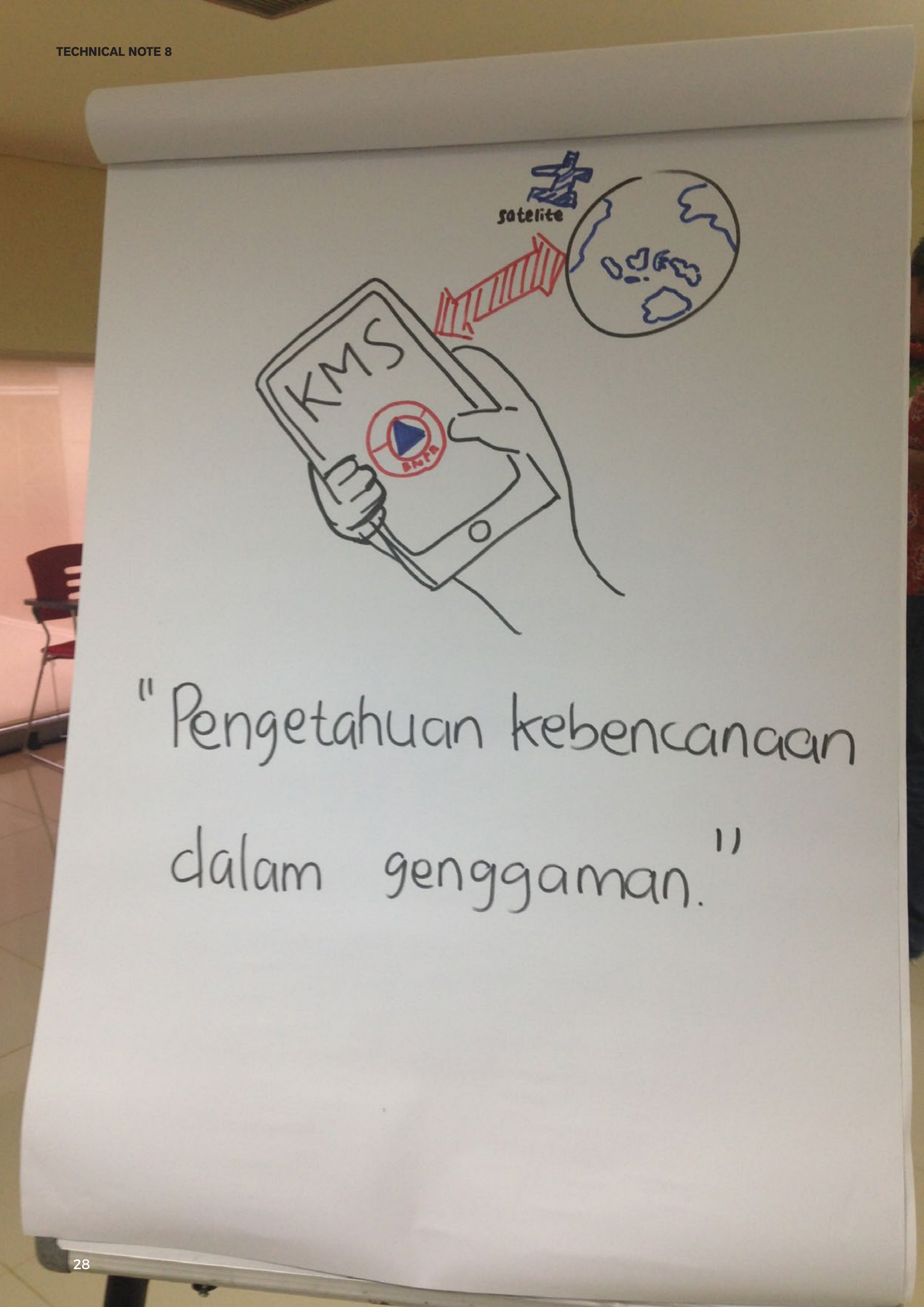
The BNPB could consider taking the lead in developing this functional career track for the staffs of BNPB and BPBDs or of other government ministries and agencies who wish to pursue professional functional career in the area of DRM. The Indonesian civil service system already has a well-developed merit and its corresponding remuneration system for these functional career tracks.

Knowledge Management in DRM combined with this functional track system will provide DRM practitioners in BNPB and BPBDs with tools and processes that will allow them to claim credit points for the operational knowledge they have accumulated, documented, and shared. These credit points could then be assessed through a structured peer review process to determine the qualification level of government DRM practitioners. Those practitioners who are Government employees and have had professional qualifications from the independent professional certification body could also receive comparable professional recognition from the Government functional track system.

Lessons Learned

Although it is still in its early stages of development, the adoption of Knowledge Management approach by BNPB has provided useful lessons for further improvement and/or adoption by other sectors. These include the following key aspects:

a. *The importance of leadership and commitment* to use knowledge to strengthen operational effectiveness: BNPB leaders and key staffs have recognized the importance of practical knowledge and experiences to improve operational effectiveness quickly by using every disaster as an opportunity to learn and improve. Such an attitude is key in making knowledge management more concrete/tangible for an action-oriented agency like BNPB and BPBDs.
b. *The Inclusion of knowledge sharing mechanism in BNPB*: The Head of BNPB's Regulation on Knowledge Sharing for disaster management provides a policy framework that sets out the key principles for actors active in disaster management in Indonesia. The next step is to make use of this policy framework to ensure that knowledge capturing, documentation, and sharing become a mandatory requirement for all BNPB and BPBD staffs to work on as part of their day-to-day assignment.
c. *A change in working culture is required for knowledge to strengthen operational capacity*: As disaster risk management deals with concrete subjects that often do not provide options, but need to be confronted, changing the mindset of DRM professionals from reactive to reflective becomes important. While DRM practitioners need to be able to properly react to particular disaster circumstances, the habit of reflecting on what works and what doesn't from past operations will improve capacity over time.
d. *The formation of the Working Group on KS/KE helped build a pool of change for the entire organization*: The working group that was established under the Head of BNPB's regulation on knowledge management served as an effective mechanism to create a pool of change agents that can bring influence and culture change toward knowledge orientation to the rest of the organization. While initially the task of being in the working group is seen as additional burden, eventually the new knowledge accumulated and visibly utilized are seen as rewarding by the working group members.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