Integrating Community-Based Adaptation Planning into Spatial Planning in Jakarta
Case Study: Marunda, North Jakarta

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February, 2018

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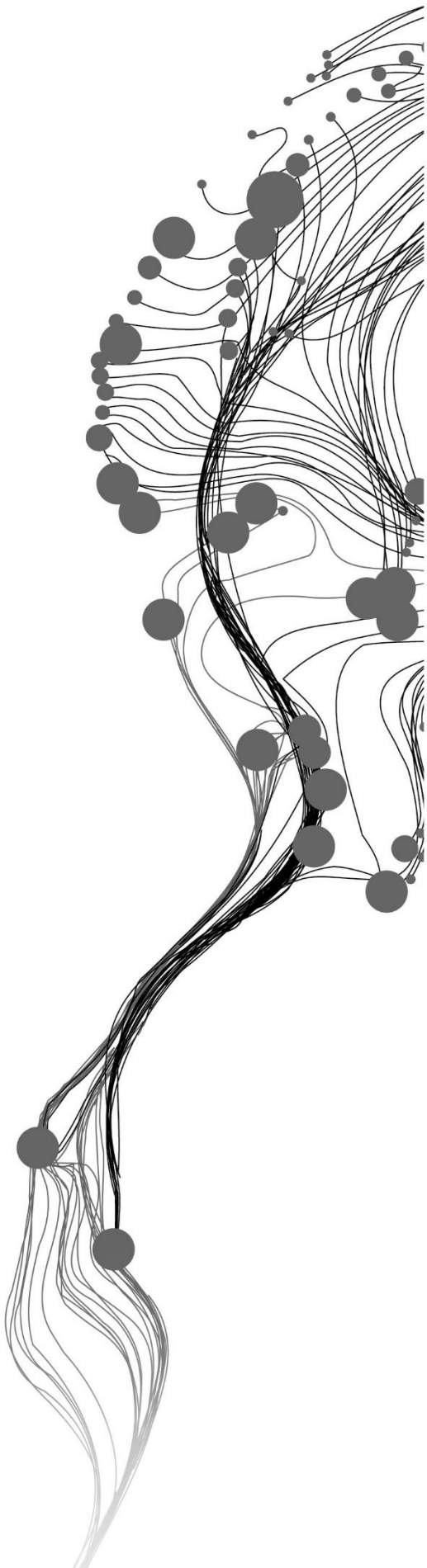

Integrating Community-Based Adaptation Planning into Spatial Planning in Jakarta
Case Study: Marunda, North Jakarta

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ABSTRACT

Integrating community-based adaptation planning into spatial planning is key policy to build a resilient urban community. Although community's planning is considerably encouraged by the local government, yet the integration process in spatial planning remains difficult. Hence, the main objective of this study is to investigate an enabling environment for integration of community-based adaptation into spatial planning with the case study in Marunda, North Jakarta, Indonesia. Marunda community and NGOs have produced adaptation planning through participatory GIS process so-called Participatory Urban Neighbourhood Assessment (PUNA). To achieve the main objective, this study specified into three sub-objectives; (1) to review the existing PUNA process, (2) to examine to which extent PUNA outputs satisfy community and local government geo-information needs, (3) to examine what constitutes an enabling environment through which PUNA outputs can be integrated into Jakarta spatial planning. This study used literature studies to review documents related to PUNA process and employed semi-structured interview, FGD, photovoice, and participatory mapping methods to obtain primary data.

The results demonstrate that (1) the PUNA process has empowered Marunda community to cope to hazards risks with their local context and capacities. However, typical GIS technology such as Web-based GIS simultaneously empowers and marginalises community in Marunda. Collaboration with government institutions in Jakarta needs to be expanded. (2) Marunda community is satisfied with PUNA outputs since they never have spatial information before. Conversely, government feel satisfied and understandably reluctant at the same time to the PUNA outputs. They essentially emphasised on the suitability between demands and provisions, coordination of information and the trust and credibility of information. (3) the five barriers recognised in adaptation literature i.e. lack of institutional arrangement, leadership, knowledge, resources, behaviour and technology were clearly evident in the case study Jakarta. Through PUNA outputs, it is believed able to solve issues on lack of knowledge and resources. Then, to provide enabling environment for the integration, the findings concern significantly on lack of institutional arrangement, lack of leadership, lack of behaviour, and lack of technology.

This study concludes that to provide enabling environment for community-based adaptation into spatial planning, there are several critical factors to be taken into consideration. There is a need for institutional change where local government should be given an authority to make a plan related to climatic uncertainty and how local level can adapt to hazards risks. The top-down development should be aligned with local-level needs. Leadership in local government is essential for the integration process. The needs for increasing the acknowledgement of adaptation issues in spatial planning by local government and community. The last, the need to encourage the government of Jakarta to focus on integrated geospatial data. The integrated geospatial data contributes not only to resolving technical issues, but also unifying those different sectoral interests.

Keywords: Barriers, Collaborative governance, Community-based adaptation planning, Enabling environment, Marunda Jakarta, PGIS, Spatial planning.

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ACRONYMS

BIG : Geo-spatial Information Agency - *Badan Informasi Geospasial*

BPBD : Provincial Disaster Management Agency – *Badan Penanggulangan Bencana Daerah*

DKPKP : Provincial Food Security, Marine, and Agriculture Agency – *Dinas Ketahanan Pangan, Kelautan dan Pertanian*

HOT : Humanitarian OpenStreetMap Team

KPBK : City Disaster Management Agency Office – *Kantor Penanggulangan Bencana Kota*

MURIA : Marunda Urban Resilience in Action

NCICD : National Capital Integrated Coastal Development

NGO : Nongovernmental Organisation

OSM : Open Street Map

PGIS : Participatory Geographic Information System

PRA : Preliminary Resilience Assessment

PUNA : Participatory Urban Neighbourhood Assessment

UBSP : Business Savings and Loans – *Usaha Bersama Simpan Pinjam*

YTBS : Yayasan Bina Tani Sejahtera

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1. INTRODUCTION

This chapter describes research context in which explain the background of the research, define research problem and set a main objective and specific objectives of the research, aimed to address the research problem.

1.1. Background

Cities are the most vulnerable locations to the adverse impact of climate change. Particularly in developing countries, urban disasters strike hardest to the urban poor, the majority of whom reside in informal areas, thus, making them more vulnerable (Rafael, Martins, Borrego, & Lopes, 2015; Stern, 2007). Low-income groups tend to be significantly vulnerable to climate change because of the poor quality of housing, unequal access to infrastructure and lack of access to essential facilities and services (IPCC, 2012; Revi et al., 2014; Satterthwaite & Mitlin, 2014; UNISDR, 2009). IPCC (2012) purported that most mortality due to disaster-related climate change is concentrated in low and middle-income countries.

With respect to the adverse impact of climate change on low-income groups particularly, the concept of community resilience has gained prominence in science and policy over the decades (Rafael et al., 2015; Sharifi, 2016). Resilience can be understood as "the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity of self-organisation, and the capacity to adapt to stress and change"(IPCC, 2007, p. 86). Hence, community resilience is determined by the ability of affected people to withstand and absorb disturbance, and self-organise to adapt and return to the functioning of their system as it was and may be (Solar, 2014). Furthermore, this concept determines their ability to learn and adapt to the adverse impact of climate change, helping them to change their perceptions and behaviours.

As the concept of community resilience has continued to spread over time, the need for community participation has been identified as the best approach to build resilience. This is because local communities have knowledge about inadequate facilities and the level of climate change impacts related to their assets and livelihoods (Ebi & Semenza, 2008; Mollel, 2010). Together with local experts, NGOs, and governmental institutions, a successful plan to build community resilience can be achieved. However, there is a fundamental conflict in knowledge paradigms, in which one body has experience in the technical and scientific background while the other has knowledge from daily living experiences. This is emphasized by Zolkafli, Liu, and Brown (2017) who postulate that the disconnect in these paradigms can propagate ineffective communication in any planning and decision-making process. Therefore, there is a need to bridge this gap and build consensus among all stakeholders especially local communities, to accommodate their initiatives by implementing a robust public participatory method (Marzuki, 2015).

Participatory Geographic Information System (PGIS) has been recognised as the contemporary practice that can bridge the communication gap between communities, local experts, and government regarding building resilient urban communities (Aditya, 2010; Padawangi et al., 2016). The term PGIS has developed in recent years, and authors refer to it as participatory mapping, community mapping, public participation GIS or PPGIS, collaborative mapping, and bottom-up GIS (Dana, 2010; Panek, 2015). With this approach, communities can share their interests and knowledge on what they need, and how they feel about their living conditions that may threaten their livelihood. It helps to translate community's knowledge into spatial

representation as a 'superior' communication approach to integrate their knowledge in formal spatial planning (Zolkafli et al., 2017).

Building a resilient urban community through an integrated planning approach is a critical need for the village of Marunda, Jakarta, Indonesia. It is because Marunda is a densely populated urban village and highly vulnerable to natural disasters. It is the home to 29,465 inhabitants (Statistics Indonesia of Jakarta Utara City, 2017). The community suffers from inequalities and faces, besides the population density, many complex problems, such as low households income, lack of access to essential services, and frequent flooding from rivers, tidal waves and high winds. Local communities together with NGOs have already built initiatives through a participatory approach. However, there is need to promote integrated planning and assimilate this initiative with the formal spatial planning of Jakarta, Indonesia.

1.2. Participation for Planning and Building Community Resilience in Marunda

In an attempt to build disaster risk resilience in Marunda, the relevant local NGOs[1] initiated a project called *Marunda Urban Resilience in Action* (MURIA) as a platform to face the complex disaster risks and climate change issues faced by the community in Marunda. This platform aimed to develop and execute multi-stakeholders approach model in which they can collaborate towards building urban resilience in the village of Marunda, North Jakarta.

The involved NGOs initiated the project by promoting multi-stakeholders' involvement to engage potential stakeholders in developing resilience and livelihood strengthening strategies through a public-space dialogue. After which, these stakeholders work together with their specific responsibilities, such as strengthening livelihood by building enterprise model in community groups as alternative livelihood through urban farming and waste collection management. Moreover, the platform sought to identify other potential business models to increase the support for market players and provide better services for the urban poor to boost their financial capacity.

On the other hand, concerning the disaster risk such as flooding, local communities and NGOs tried to minimise the risk by strengthening the community's capacity using maps for identifying risks, capacities, and potential for development in response to preparedness. This was done by involving Marunda community in a *Participatory Urban Neighbourhood Assessment* (PUNA). The outputs of PUNA itself are a *community-based adaptation* (CBA)[2] in which could help people to adapt in response to disaster risk. As one of the results, these initiatives identified the main threat as flooding which is caused by rain and the overflowing river that is worsened by erosion. Meanwhile, volunteered geographic information (VGI) was also proposed to form and facilitate preparedness using Ushahidi platform. Ushahidi is crowdsourcing tool which provides software and services for people to raise their voices, improving bottom-up information (Ushahidi, 2017). This is done by involving youths groups to produce maps and show information related to preparedness measures. It also helps to provide real-time information on the occurrence of a disaster (Albuquerque, Herfort, Eckle, & Zipf, 2016).

1.3. Research Problem

Spatial planning is an essential element to reduce disaster risk in cities, especially in the cities of the developing countries with high vulnerability (Wijaya et al., 2017). On the other hand, community-based adaptation is a prominent element to adapt and mitigate the risk (Archer et al., 2014). Considering these two

[1] The NGOs that involved in MURIA project are Cordaid, PT. Bina Swadaya Konsultan (BSK), Yayasan Bina Tani Sejahtera (YTBS)

[2] PUNA outputs and Community-based Adaptation Planning are used interchangeably in this research.

important sides, integrating grass-root initiatives regarding community resilience into spatial planning becomes essential as a key policy in response disaster risk to build a resilient community (Barton, Krellenberg, & Harris, 2015; Wijaya, 2015). As of now, there is limited integration of communities' adaptation planning with formal planning initiatives at the city level in Indonesia (Lassa, 2011).

In order to foster this integration, there is a need to establish *collaborative governance* frameworks (Mardiah, Lovett, & Evanty, 2017; Wanna, 2008). Mardiah et al. (2017) argued that investigations of collaborative governance framework especially in mainstreaming community-based planning is remaining the least explored. According to Emerson, Nabatchi, and Balogh (2012), the dimension of *capacity for joint action* in collaborative governance framework will assure an effective integration.

This research involves an assessment of PUNA process and outputs. It focuses on the conceptualisation of PUNA process, to which extent the PUNA outputs meet users' needs, and the barriers influencing an integration of PUNA outputs into spatial planning in Jakarta.

1.4. Research Objectives

The general objective of this research is to investigate an enabling environment for integration of PUNA output as community-based adaptation planning into Jakarta spatial planning. This research is underpinned by two main concepts; PGIS framework and collaborative governance in which to evaluate the PUNA process and output, as well as to examine perception of local government associated with Jakarta spatial planning toward PUNA output. Thus, to achieve the general objective, several specific objectives were generated;

1. To review the existing PUNA process used in building resilient communities in Marunda,
2. To examine to which extent the PUNA outputs satisfy the communities and local government needs,
3. To examine what constitutes an enabling environment through which PUNA outputs can be integrated to Jakarta spatial planning from collaborative governance perspective.

1.5. Research Questions

The following research questions are being identified as to answer the research objectives;

1. To review the existing PUNA process used in building resilient communities in Marunda
   1.1. What are the key elements of the existing PUNA process?
   1.2. How can the PUNA process be structured conceptually based on PGIS framework?
2. To examine to which extent the PUNA outputs satisfy the communities and local government needs
   2.1. What are the communities and local government geo-information needs related to resilience?
   2.2. Does the current PUNA outputs contain adequate information for communities and local government needs?
   2.3. How can these outputs be improved to be useful for the identified needs of the communities and local government?
3. To examine what constitutes an enabling environment through which PUNA outputs can be integrated to Jakarta spatial planning from collaborative governance perspective.
   3.1. What are the barriers influencing the integration of PUNA outputs into spatial planning against dimensions of collaborative governance?
   3.2. How can these PUNA outputs be integrated into spatial planning in Jakarta from collaborative governance perspective?

1.6. Significance of the Research

This study intends to contribute to narrowing a gap in a scientific manner of how Jakarta spatial planning can reflect collaborative governance framework, so then this reflection can create an enabling environment for the integration of community-based adaptation planning in official spatial planning. This study also helps to identify good practice for PUNA and its finding could provide a concrete recommendation on optimising the community resilience in Marunda. The knowledge could help NGOs and other actors as facilitators of community participatory mapping process. It is expected that this research will be as a strong base to develop future projects that can be linked to official spatial planning.

1.7. Thesis Structure

This thesis discusses five chapters. Detail of each chapter as follow:

- **Chapter 1: Introduction;** this chapter describes the background of study, research problem, research objective, research question, and structure of the thesis.
- **Chapter 2: Literature Review;** this chapter reviews all concepts which are related to the thesis such as overview of PUNA, PGIS framework, overview of PGIS practices, barriers to integrating the community-based adaptation planning in spatial planning in Indonesia, definition of collaborative governance and framework, global examples of integration for community-based adaptation planning into spatial planning, and conceptual framework.
- **Chapter 3: Methodology;** this chapter contains area study, research design, semi-structured protocols design, data collection, data analysis, validity and reliability, and ethical consideration.
- **Chapter 4: Result and Discussion;** this chapter presents the finding of this study regarding the three research objectives and discuss critically the results that have been found in terms of the three research objectives.
- **Chapter 5: Conclusion and Recommendation;** this presents conclusions based on what has been found in this research and some recommendation to policy-making based on research results.

2. LITERATURE REVIEW

This chapter presents an overview of the relevant literature, including PUNA, PGIS, Collaborative Governance, and several global examples of barriers influencing the integration of community-based adaptation planning into spatial planning.

2.1. Overview of Participatory Urban Neighbourhoods Assessment (PUNA)

As mentioned in proceeding section (section 1.2), *MURIA* is a platform or project to help the community in Marunda in building a resilience in response to disaster risks. Under the MURIA platform, *PUNA* is an approach that is developed by the involved NGOs to help the community in Marunda identifying their challenges and opportunities to stand with disaster risk and climate change. It is an effort of community-based to have a robust planning (as community-based adaptation planning) to adapt and mitigate the risk related to disaster and climate change.

PUNA adopts a qualitative participatory approach in which engage individuals and community groups as an object of the analysis (Cordaid, 2015). This approach encompasses two approaches, i.e. qualitative and participatory. To obtain the objective of this qualitative approach, the involved NGOs conducted an in-depth interview with individual and groups of communities in Marunda. In sequence, for participatory approach, the practitioners together with communities conducted Focus Group Discussion (FGD) to identify community resilience profiles, to probe development history of Marunda as well as to map the area related to livelihood and risk of disaster and climate change.

In this case, PUNA is guided by the resilient framework of Cordaid [3]. The framework includes individual/community groups as risk element, basic needs, livelihood, ecosystem/environment, systems and structures, as well as regulations and policies. As for tools used during the participation and analysis processes were conventional tools that commonly used in participatory community practices such as village history, season calendar, flowchart, FGD, in-depth interview, and transect mapping. Improving the results of participatory community initiatives, NGOs involved youths groups in helping developing digital mapping and area transects using Ushahidi website platform so that the resulting maps can be used and widely accessed in support of transparency and inclusion.

It is believed that PGIS is a robust approach for empowering people in decision-making process. As for, in this research, the process of PUNA will be examined further based on PGIS framework in order to have a good practice in participatory approach for the community.

2.2. Overview of PGIS Practices

Participatory Geographic Information Systems (PGIS) is a concept that has developed by social science and GIS scientists to represent the participatory local-level in the use of spatial representation with sketch maps, image maps, remote sensing images, scale maps, or other georeferenced materials over the decades (Carver, 2003; McCall & Dunn, 2012). It enables integration of "lay knowledge of spatial arrangement into expert knowledge" (Zolkafli et al., 2017, p. 108). As such, according to Zolkafli et al. (2017), PGIS can empower individuals or communities groups that have not been involved in planning processes. Similarly, Schroeder (1996, as cited in Sieber, 2006) argued that essentially PGIS focuses on the engagement of the public in the application of GIS with the goal of improving the transparency of and influencing government policy. Two

[3] Cordaid is nongovernment organisation based in the Netherlands which initiated MURIA Project

examples of PGIS practices in building resilient communities are presented to enhance understanding of the sort processes investigated in this research.

2.2.1. PGIS Framework for Building Community Resilience in India

Building community resilience project has been done by the Energy and Resource Institute (TERI), India using participatory GIS approach (The International Centre for Integrated Mountain Development (ICIMOD), 2015). The project attempted to incorporate community's local knowledge of disaster and climate change risks in Uttarakhand. Uttarakhand is located in the foothills of Indian Himalayas. Some of the activities were conducted including preparing flood hazard zonation maps, analysing people preparedness of flood risks, coping strategies, and assessing local government policy and strategies to reduce disaster risks.

Together with the community, this action collected data through focus group discussion (FGD) and household level surveys. This project involved directly with the community, empowering their participation in analysing the risk and take part in the decision-making process.

2.2.2. Assessing Vulnerability with PGIS Methods in Búzi, Mozambique

Research on Kienberger and Steinbruch (2005) describes PGIS methods in vulnerability assessment, case study Búzi, Mozambique. PGIS methods were applied to assess community's vulnerability to hazards such as cyclones, flood and drought in which this action was under the PRODER-GTZ project. The assessment was conducted in nine communities of Búzi district and eight communities of Chibabava. Then, the process of assessment included data collection (social and economic base data using data revision and interviews), detail mapping of infrastructure (public buildings, drinking water access, roads, bridges) with GPS and image mapping.

In participation process of semi-structured interviews, women were separated from men to avoid conflicts due to given social structures and gender specific working tasks. Also, transect walk was guided by community representatives as well as community mapping and agricultural cycle. Interestingly, local people understood easily about spatial issues even they use maps for teaching pupils about their community environment. It mentions that PGIS is suited to be implemented in the assessment of community vulnerability.

However, some challenges related to PGIS and vulnerability have been found that both concepts are not established as a definitive methodology. PGIS and the objective of vulnerability assessment are not well-connected with practitioners, as the discussions are principally conducted merely in the scientific world. Therefore, they recommended that practitioners should be strongly involved in scientific researches of PGIS and vulnerability in the local level.

2.3. Participatory Geographical Information System Frameworks

In recent years, there are numerous pieces of literature providing a set of analytical framework to evaluate the use of GIS in public participation practices. The aim is for deriving a clear understanding and generalisability of PGIS practices as well as the goal of PGIS itself. It is believed that PGIS can empower marginalised groups to deliver their voices to decision making processes (Corbett & Keller, 2005; McCall, 2003; McCall & Dunn, 2012; Sieber, 2006; Verplanke, McCall, Uberhuaga, Rambaldi, & Haklay, 2016), however certain technology which is used in PGIS practice can marginalise community at the same time (Corbett & Keller, 2005; Sieber, 2006). It is critical to choose a framework which fit with particular practice such as PUNA that has been conducted by nongovernmental organisations related to its process, goal, and

technology. Several instances of PGIS frameworks from several literature are provided. In this research, the participatory GIS framework from Sieber (2006) is selected to examine the PUNA process.

Table 1. PGIS Frameworks Comparison

Literatures	PGIS Frameworks Components	Aims
Geo-information tools for participatory spatial planning: Fulfilling the criteria for 'good' governance? (McCall & Dunn, 2012)	• Criteria Good Governance ✓ Accountability ✓ Legitimacy ✓ Respect ✓ Equity ✓ Competence	The recognition and validation of local knowledge
A Framework to Evaluate User Empowerment in Decision-Making Experiences with Participatory GIS (Furtado, Furtado, & Furtado, 2016)	• People • Information • Decision-making process	Evaluate users empowerment towards GIS
An Analytical Framework to Examine Empowerment Associated with Participatory Geographic Information Systems (PGIS) (Corbett & Keller, 2005)	• Information • Process • Skill • Tools	Examine PGIS goals (empowerment) in individuals and community scale
Public participation geographic information systems: A literature review and framework (Sieber, 2006)	• Place and people • Technology and data • Process • Outcome and evaluation	Examine the use of GIS to broaden public involvement in policy-making and to the value of GIS to promote the goals of nongovernmental organizations and community-based organizations.

McCall and Dunn (2012) explored the potential contribution of PGIS towards participatory spatial planning using criteria of good governance. The criteria includes accountability, legitimacy, respect, equity, and competence. This framework focuses on participation and the recognition and validation of local knowledge in work of government involves citizen to share their local knowledge for spatial planning. As such, this overarching framework can be used for evaluating a practice where the government as facilitators and it is considered relatively fuzzy to evaluate potential effect of the use of certain technology in participation process.

Different from components and goal of PGIS framework by McCall and Dunn (2012), Furtado, Furtado, and Furtado (2016) provided framework in a focus on evaluation of user empowerment with PGIS. They examine users' empowerment based on the users experiences while making use of PGIS. This framework only focuses on interaction amongst users of PGIS which consist of three elements, namely people, information, and decision-making process. This framework is highly recommended for practitioners in evaluating actors/users experiences in using GIS technology in participation process.

Another analytical framework for PGIS from Corbett and Keller (2005) that focused on examining the essential goal of PGIS which is empowerment. The authors argue that empowerment remains vague. As such, they characterise the empowerment into two categories, including empowerment and empowerment capacity to be able to observe and record in a logical and structure manner. Empowerment here is that "an increase in social influence or political power. Conversely, disempowerment is a decrease in social influence or political power", where empowerment capacity refers to "aspects of the deeper process of change in the internal condition of an individual or community that influence their empowerment" (Corbett & Keller, 2005, p. 93). The framework combines four catalyst of empowerment, namely information, process, skills, and tools. Also, it focus on individuals and community scales. As such, this framework focuses only on community empowerment and neglect the effect of public participation.

Sieber (2006) also constructed analytical framework for analysing PGIS practice. The author focuses on evaluating PGIS practice that is conducted by NGOs. The author provide a basic range of themes to evaluate the process, goal, and technology. The themes consist of place and people, technology and data, process, and outcome and evaluation. This framework considers not only participants, but also public engagement in process in which this research intends to examine the involvement of all stakeholders in PUNA process. In addition, it critically examines the technology in which can be used for evaluating GIS technology that has been used in PUNA process. This framework is developed to evaluate the use of GIS of NGOs projects or programs in public involvement for policy-making processes. Since PUNA also as a form of PGIS practice from NGOs, then this framework is applicable to evaluate the practice. As such, this study will adopt PGIS framework of Sieber (2006) to examine PUNA process.

According to Sieber (2006, p. 503), "overall the framework demonstrates that much remains to be understood in PGIS, such as the generalizability of projects, the appropriate extent of technology, the nature of access and participation, and the concrete evaluation of PGIS effects". The four key themes are described below.

a. Place and People

This theme considers place that is influenced by cultures, scale and geographic extent. As Sieber (2006, p. 494) mentioned that "place determines the texture of social networks that exchange information and skills". Moreover, cultures also influence PGIS. Cultures can vary in their tolerance of expert solutions, their sense of collective control, and their level of individualism (Carver, 2003 as cited in Sieber, 2006). In addition, scale and geographic extent are important elements since they affect the intensity with which people connect with local issues (Carver, 2003 as cited in Sieber, 2006). Sieber (2006, p. 495) argued that PGIS is a localised activity which filled with cultures and socio-political influences, then for "one type of place and peoples often are applied to far different arenas". Therefore, this theme is able to describe PUNA process situationally and culturally.

On the other hand, this theme also differentiates between stakeholders and the public. Stakeholders are defined in PGIS practice as "people who are affected by, bringing knowledge and information to, and possess the power to influence a decision or program" (Sieber, 2006, p. 495). This element is considered as essential element since the number and type of stakeholders, relationships among stakeholders will affect the output of a PGIS practice (Sieber, 2006). Meanwhile the public is described as people who have different intensities of skills and attention engage in PGIS process (Sieber, 2006). The element of the public itself is highly considered to describe a collaboration process that PUNA has been done.

Hence, this theme has tangible elements that are essential to manage PGIS practice. As such, this theme can be used to evaluate the institutional arrangement of PUNA process about how practitioners mediate the

ground rules or process rules. Therefore, this theme can measure the degree of institutional arrangement in PUNA process.

b. Technology and Data

This theme contains four elements that should be considered in evaluating PGIS practice which are *extent of GIS technology*, *accessibility of data*, *appropriateness of information*, and *representation of knowledge*. It should be remembered that "given an ever-broadening range of technologies, an effective PGIS application depends on understanding how much and when technology should be brought into a process" (Sieber, 2006, p. 497). Moreover, many stakeholders lack access to the spatial data (Sieber, 2006), either this is due to the option of technology to present information or it is back to the human capital that has no capacity to use the technology. This theme is much more related to knowledge and resources. Thus, this theme is necessary to be concerned.

On the other hand, information that has been produced should be reliable and trusted. There are numerous examples of PGIS where information are available but exist in wrong format, incomplete, or cannot be access (Sieber, 2006). Hence, elements of *accessibility of data* and *appropriateness of information* are keys to be analysed in order to evaluate PUNA practice. Moreover, *representation of knowledge* also is principally important where local knowledge is to be integrated (Sieber, 2006). Then, the way to present local knowledge and the options of technology as tool to present them are crucial. Since PUNA outputs also are represented by selected technology, yet it could be if cannot be used or read appropriately by users. Therefore, this theme is used to examine the PUNA process.

c. Process

This theme has been considered three main processes; *system implementation and sustainability*, *participation and communication in the policymaking process*, and *decision-making structures and processes*. System implementation in this theme refers to the adoption of GIS technology by NGOs (Sieber, 2006). This element reflects the value of GIS technology that is operated to acquire, install, apply, and maintain GIS outputs to have a sustainability of the project outputs. It is important to note that costs for hardware and software in developing countries tend toward high-priced and GIS expertise few to maintain GIS technology (Sieber, 2006). Then, this element can bring a discussion the way of PUNA practice sustains their GIS outputs.

On the other hand, in this theme also concerns on how PGIS can be informed in policy-making process. Ideally, PGIS increases the involvement of marginalised groups and influences in public policy-making. At that point, if PGIS is succeed to be communicated in policy-making process, then at least structures must be built or context must be acknowledged, yet both need to be executed at multiple scales (Sieber, 2006). About how PUNA is communicated in policy-making process would be necessary to be discussed. It will measure the degree of collaboration with local government.

d. Outcomes and Evaluation

The outcome in this theme refers to the material such as outputting maps and developing Web-GIS to the discursive. Discursive goals include empowerment, enlarge participation, inclusion, equity, and increased democracy (Sieber, 2000; Weiner, Harris, & Craig, 2002). The outcome of PGIS practice can be instantaneous empowerment and marginalisation of a particular group (Sieber, 2006). Then, whether the PUNA practice can produce the expected results or not, thus this theme can evaluate how far the outputs of such PUNA practice can empower particular community or group.

Furthermore, measuring the PGIS effectiveness, the difficulties emerged from the demands to make a causal relationship between technology and outcome (Sieber, 2006). Other researchers (Laituri, 2003; McCall, 2003) argued that the benchmark for PGIS project should be matched with an organisation's existing activities and adapted to local conditions. It is fairly vague when there is no clear definition of an idea into

practice for measuring PGIS goals. Hence, to have a set of goals that is effective to produce, this element has to be taken into consideration for describing PUNA process.

To sum up, this framework covers all vigorous elements to describe PUNA in practical work to have an appropriate instance of PGIS practice. It will be a discussion to find an enabling environment from bottom-up perspective for the integration of community-based adaptation planning into spatial planning in Jakarta based on collaborative governance perspective.

2.4. Collaborative Governance

In general term, *governance* is a relationship between the governed (citizens/civil society/their institutions) and the governing (the government and its institutions, and private sector interests) (McCall & Dunn, 2012). According to Gupta et al. (2015, p. 219), governance is "both an analytical and a normative tool. In its analytical incarnation, governance helps us understand how society manages itself, who acts, how, why and for what purposes. From a normative perspective, the shift from government to governance was justified by the way in which it would democratise society and make it less top-down". Within the context of collective action, governance can be defined as an action to govern collaboration in the public and/or private sector (Emerson et al., 2012). As such, Emerson et al. (2012) *collaborative governance* as the process of decision-making and structures of public policy that involves people constructively across boundaries of all elements of stakeholders to carry out the common purpose.

In this study, collaborative governance is used as a framework for examining the integration community-based adaptation into spatial planning in Jakarta.

2.4.1. Collaborative Governance Dimensions

Integrating community-based adaptation into spatial planning becomes fundamental for minimising future costs related to climate change impact and improving response to preparedness for vulnerable people and critical infrastructure (Barton et al., 2015; Wijaya et al., 2017). As can be seen, community-based adaptation is an action from people toward climate change adaptation, while climate change adaptation itself is considered as cross-boundary issues that involved all stakeholders in taking action (Barton et al., 2015). Therefore, collaborative governance perspective has a potential to contribute to more robust strategies for the integration of PUNA outputs into spatial planning in Jakarta.

Emerson et al. (2012) has constructed a conceptual framework of collaborative governance that is grounded in empirical studies, such as cross-sector collaboration, collaborative planning, collaborative governance, collaboration processes, collaborative public management, network management, and environmental governance and conflict resolution. Although this conceptual framework has a challenge, i.e. lack of generalizability (Emerson et al., 2012), by comparing the barriers influencing integration of climate change adaptation to urban development in Indonesia which Wijaya (2015) found in his research (will be described later in section 2.7), this framework has similar variables which can be used for investigating the integration of PUNA outputs into spatial planning in Jakarta.

The framework for collaborative governance has nested dimensions in collaborative governance regime, namely *collaborative dynamics*, and *actions*. Since this framework captures a wider range of emergent forms of collaborative governance (Emerson & Gerlak, 2014; Emerson et al., 2012), we need to justify the dimension which fit with a particular context (Emerson & Gerlak, 2014). Collaborative dynamics consist of three sub-dimensions which are *principled engagement*, *shared motivation*, and *capacity for joint action*. In brief, *principled engagement dimension* considers basic engagement procedure in which can effectively bring different stakeholders in one place to work together resolving problems. *Shared motivation dimension* ideally sets different

perspectives into one goal and share commitment to reach an effective goal of all stakeholders. On the other hand, *capacity for joint action dimension* is a stage where a collection of cross-stakeholders that come together to create an effective action for policy implementation.

Considering condition in Marunda wherein such collaboration practice (specifically in principled engagement and shared motivation) has been conducted through PUNA, then this research focuses on finding an *enabling environment* for integrating community collaboration initiatives outputs into official spatial planning. Thus, to investigate the issue, we focus on the usage of *capacity for joint action dimension*. This dimension will be used as means for assessing the barriers influencing the integration. This dimension consists of four variables, namely *procedural/institutional arrangements*, l*eadership*, *knowledge*, and *resources* (see Figure 1).

			The Collaborative Governance Regime					
			Collaborative Dynamics				Collaborative Outcomes	
Dimension and Components	System Context	Drivers	Principled Engagement	Shared Motivation	Capacity for Joint Action	Outputs Collaborative Actions	Impacts	Adaptation
Elements within Component	- Resource Conditions - Policy Legal Frameworks - Prior Failure to Address Issues - Political Dynamics/ Power Relations - Network Connectedness - Levels of Conflict/Trust - Socio-economic/ Cultural Health & Diversity	- Leadership - Consequential Incentives - Interdependence - Uncertainty	- Discovery - Definition - Deliberation - Determinaton	- Mutual Trust - Mutual Understanding - Internal Legitimacy - Shared Commitment	- Procedural/ Institutional Arrangements - Leadership - Knowledge - Resources	Will depend on context and charge, but might include: - Securing Endorsements - Enacting Policy, Law, or Rule - Marshalling Resources - Deploying Staff - Siting/ Permitting - Building/ Cleaning Up - Enacting New Management Practice - Monitoring Implementation - Enforcing Compliance	Will depend on context and charge, but aim is to alter pre-existing or projected conditions in System Context	- Change in System Context - Change in the CGR - Change in Collaboration Dynamics

Figure 1. Collaborative Governance Framework. Source: Emerson et. al., 2012

Procedural or institutional arrangements refers to "the range of process protocols and organisational structures necessary to manage repeated interactions over time" (Emerson et al., 2012, p. 15) such as agreements to facilitate ground rules, operating procedures, decision rules and so forth. In this variable, the agreements must be supplemented with formal institutional designs such as rules or regulations. Therefore, this variable will be used to analyse whether Jakarta spatial planning framework provides a space for people to make bottom-up planning.

The second variable in capacity for joint action is *leadership*. Leadership has an important role since it will embrace and empower all stakeholders to be involved in the decision-making process (Ansell & Gash, 2008; Emerson et al., 2012). It can influence the result of planning itself. As such, this variable will be used to examine whether Jakarta spatial planning authorities provide facilitations or mediations for the community to participate in decision-making process.

Knowledge is the third variable in capacity for joint action. Knowledge refers to "the social capital of shared knowledge that has been processed, weighed, and integrated with values and judgments of all participants" (Emerson et al., 2012, p. 16). This variable will be used to measure information and understanding related to disaster risks.

Resources are the last variable in capacity for joint action. Resources can be seen as budget support, time, technical skills, or organisational assistance to have a successful bottom-up planning, including the process of integration (Emerson et al., 2012; Wijaya, 2015). Thus, this variable will be used to examine whether Jakarta spatial planning allocates supports for conducting participatory planning.

2.5. Relating the PGIS Framework to Collaborative Governance

This section reviews relationship between two main concepts that are undertaken in this research, namely PGIS and Collaborative Governance. Both concepts are fundamental concepts that can bridge communication between community and authorities in a more collaborative planning process (Barton et al., 2015; McCall & Dunn, 2012; McCall & Michael, 2014; Rambaldi, Kyem, McCall, & Weiner, 2006; Sieber, 2006; Zolkafli et al., 2017). The use of these two concepts in this research provides insight for stakeholders to enable or constrain the integration of community-based adaptation into spatial planning in Jakarta. As such, This research applies PGIS framework from Sieber (2006) which consist of four themes; place and people, technology and data, process, as well as outcome and evaluation. Whilst, collaborative governance framework which is used focus on capacity for joint action dimension by Emerson, Nabatchi, & Balogh (2012). It has four elements, named institutional arrangement, leadership, knowledge, and resources.

The theme of *place and people* essentially has links to institutional arrangement, leadership, and knowledge elements. As it is known that this theme is influenced by local culture and geographic extent (Sieber, 2006). Then, de Man (2003, cited in Sieber, 2006, p. 495) argued, "information access as well as participation in decision making will differ according to factors such as a culture's ability to absorb uncertainty, its level of masculinity, and its ability to accommodate human inequality". Supportably, Sieber (2006, p. 495) stated that "cultures can vary in their acceptance of PGIS on the basis of their tolerance of expert solutions, their sense of collective control, and their level of individualism". It indicates that culture is essentially social capital that possessed by individual or groups (Mcewen, Holmes, Quinn, & Cobbing, 2017; Palamida, Papagiannidis, & Xanthopoulou, 2017; Woodbury, 1993). Similarly, as explained in collaborative governance dimension section that knowledge refers to the social capital (Emerson, Nabatchi, & Balogh, 2012). Hence, it is evidence that this theme highly related to knowledge in collaborative context.

In sequence, this theme also covers stakeholders as the one who are affected by and give information to and the public as the one who take a part in PGIS process with different skills and attention (Sieber, 2006). This theme provides an understanding of the way stakeholders and the public play their roles in PGIS practice. It is regarded to definition of institutional arrangement which refers to "the range of process protocols and organizational structures necessary to manage repeated interactions over time" (Emerson et al., 2012, p. 15). Thus, it can be noted that the place and people theme can reflect the view of institutional arrangement element of collaborative perspective. Moreover, in relation to the roles that stakeholders and the public play in PGIS practice, it is highly related to leadership element. Leadership in the context of capacity for joint action dimension relates to the roles of each actors during moments of collection of information, deliberation, and still others in supporting the collaborative determinations through to accomplishment (Emerson et al., 2012).

Moreover, *technology and data* theme intentionally relates to resources and knowledge elements in collaborative governance perspective. This theme considers not merely the technology but the data, in the matter of appropriateness, accuracy, access, ownership and representation (Sieber, 2006). Consideration of using certain technology to disseminate local spatial knowledge can bring a specific debate in accordance with resources and knowledge of users basically (Sieber, 2006). For instance, Sieber (2006) stated that generally community members are not engaged in technical part of GIS. It relates strongly with what resources means in collaborative governance point of view that technical support and organisational assistance can produce

a successful bottom-up approach (Emerson et al., 2012). Hence, this theme can bring a discussion from bottom-up perspective for potential resources in collaborative governance perspective.

Furthermore, *Process* theme has relation with four elements of capacity for joint action dimension of collaborative governance. Ideally this theme considers dissemination and maintenance of community knowledge toward GIS. Thus, it reviews system implementation and sustainability of GIS through to communication in policy-making process which empowers community at last. Then, Sieber (2006) argued, PGIS implementation should be divided by the level of coordination within organisations or networks. As such, leadership and institutional arrangements are essential as collection of external drivers or the public to cultivate multiple opportunities for GIS implementation (Emerson et al., 2012; Sieber, 2006). Although there could be an existence of full-bodied coordination within different organisations or networks, resources factor must be taken into account to make sure long-term sustainability of the GIS (Emerson et al., 2012; Sieber, 2006; Wijaya, 2015).

2.6. Barriers to Integrating the Community-basaed Adaptation into Spatial Planning in Global Examples

According to Carmin, Anguelovski, and Roberts (2012), disaster risk reduction and climate change adaptation are relatively new in action for cities of which currently there are no standards or norms for planning at the city level, and different cities adopt various approaches to implement preparedness actions. Several global examples (see Table 1) on integrating grass-root initiatives for a resilient community into spatial planning associated with barriers and challenges are described in this study.

Table 2. Barriers and Challenges in Global Examples

Case	Barriers and Challenges
Adapting to climate change through local municipal planning: barriers and challenges (Measham et al., 2011)	There are three main barriers documented in the adaptation, i.e. lack of information, lack of resources, and institutional limitations At the institutional level, the challenge is much harder to address, i.e. institutional context. In case of lack of information, there is lack of useful, credible and relevant information of the nature of climate risk in which government need to adapt to be a key barrier for planning. Regarding lack of resources, the need further information such as through detailed hazard mapping to support best available estimates. The challenge for local government is to understand climate adaptation as cross-sectoral issues.
Integrating climate change into long-term strategic city development planning: the case of Cape Town (Taylor, 2013)	People have different perceptions about the problems, leading to propose a wide array of solutions which are difficult to compare and weigh up. People have a different language, then it is difficult to describe the problems. "From both a planning and management perspective, the challenge is how to develop a suite of programs and projects that fit the functional units, timeframes and operational capabilities of the city while adding up to a "game changer" as envisaged in the planning" (Taylor, 2013, para. 14).

	"A lack of detailed information on when and where climate impacts are experienced and remedial action is needed and viable makes it difficult to translate the strategic goals and strategies into operational plans" (Taylor, 2013, para. 14). "The fiscal constraints that local government in South Africa work under limit the public investment that can go into implementing the strategies laid out in the planning" (Taylor, 2013, para. 16)
Integrating climate risk management into the district development planning system in Malawi (Olhoff, 2011)	There is limited coordination of activities of climate change adaptation (CCA) and disaster risk reduction (DRR). Lack of financial resource and technical capacity at all level of government to address CCA and DRR. Lack of capacity building on CCA and DRR in the community. Linkages and coordination with other partners are not in place. "Lack of coherent national policies on CCA and DRR" (Olhoff, 2011, p. 26)

In summary, the barriers and challenges are mainly about lack of information for both community and government, capacity building for the community, financial resources and support, and institutional context extent to governance system, planning and management. These examples will provide a broad range of barriers from different cities as a reflection to integrate the community-based adaptation planning into spatial planning especially in Jakarta context.

Concerning dimension of capacity for joint action of collaborative governance, the identified barriers have similarity with element of the dimension. For instance, barrier in institutional context extent to governance system, planning and management relates institutional arrangement element. Barrier in lack of financial resources and support links to resources element. Then, barrier in lack of information for both community and government correlates with knowledge element. The last, barrier in capacity building in community is relevant to leadership. Hence, the use of collaborative governance framework that focus on capacity for joint action dimension can reveal the barriers in integrating community-based adaptation planning into Jakarta spatial planning which this research aims to do.

2.7. Barriers to Integrating the Community-based Adaptation into Spatial Planning in Indonesia

In research of Wijaya (2015), there are four barriers that should be understood to enhance the effectiveness and improvement in the context of decision-making and policy related to the integration of community-based adaptation in Indonesia. In his research, four barriers are found including institutional and managerial, knowledge and information, financial and economic, as well as social and behavioural. The author used Weight Average Index (WAI) to measure the degree of barriers.

a. Institutional and Managerial

Institutional barriers are associated with coordination between different level authorities. In Indonesia, there are several organisations and institutions involved in the integration, and they all have their priorities. However, the final decision is set by the National Development Planning Agency (BAPPENAS) as the highest institutional in Indonesia which has a particular focus on the policy regarding development and climate change issues.

In managerial context, the barriers are related to the functions, responsibilities, position of management in the process of integration. The specific barriers in this context are insufficient planning and

management, inadequate collaboration and coordination, lacking capacity building and institutional capacity, and the deficiency of law and regulation enforcement.

The author revealed that the barriers to lack of law and regulation reinforcement, inadequate collaboration and coordination, inadequate capacity building and institutional capacity have a high score. While, the barrier on insufficient planning and management has a low score. It indicates that to achieve the optimal integration, legitimacy, capacity building, and collaboration & coordination among stakeholders should be highly taken into account.

b. Knowledge and Information

There are specific categories of this barrier, namely insufficient information, limited understanding, and lack of dissemination and knowledge sharing. The study found that all categories have significant problems in the integration.

c. Financial and Economic

The financial and economic element is important in the process of integration. This barrier has detailed indicators among others insufficient budget, lack of financial support from the government, and inadequate financial resources. The result showed that indicators of lack of financial support and inadequate financial resources have a high score, whereas barrier of the insufficient budget has a moderate score. The study revealed that Indonesia still needs international support to the adaptation implementation in development planning.

d. Social and Behavioural

The authors argued, the stakeholders' view that this issue as an ineffective measure and potentially harming their interest. The indicators of this barrier are limited awareness and participation, behavioural and lifestyle people, and lack of strong leadership. The result revealed that the overall indicators of barriers show a high score. It means that this barrier is important to take into account.

2.8. Conceptual Framework

This research is illustrated by a conceptual framework (see Figure 2) with one focus that draws upon two main concepts. The focus of this research is to investigate an enabling environment for integration of PUNA output as community-based adaptation planning into Jakarta spatial planning. In the process of integration, there are several identified barriers that might influence the process which are based on Wijaya (2015) and several global examples wherein have similarity. As such, this research is underpinned by two main concepts. The first concept is PGIS which is relevant to evaluate PUNA process, so that as a reflection for supporting the second concept to examine barriers. The second concept is collaborative governance which is relevant to investigate the way in which spatial planning can provide enabling environment for the integration between community-based adaptation planning to Jakarta spatial planning. Together the two concepts are purposely undertaken to examine the barriers that influence the integration from the view of bottom-up and top-down approaches.

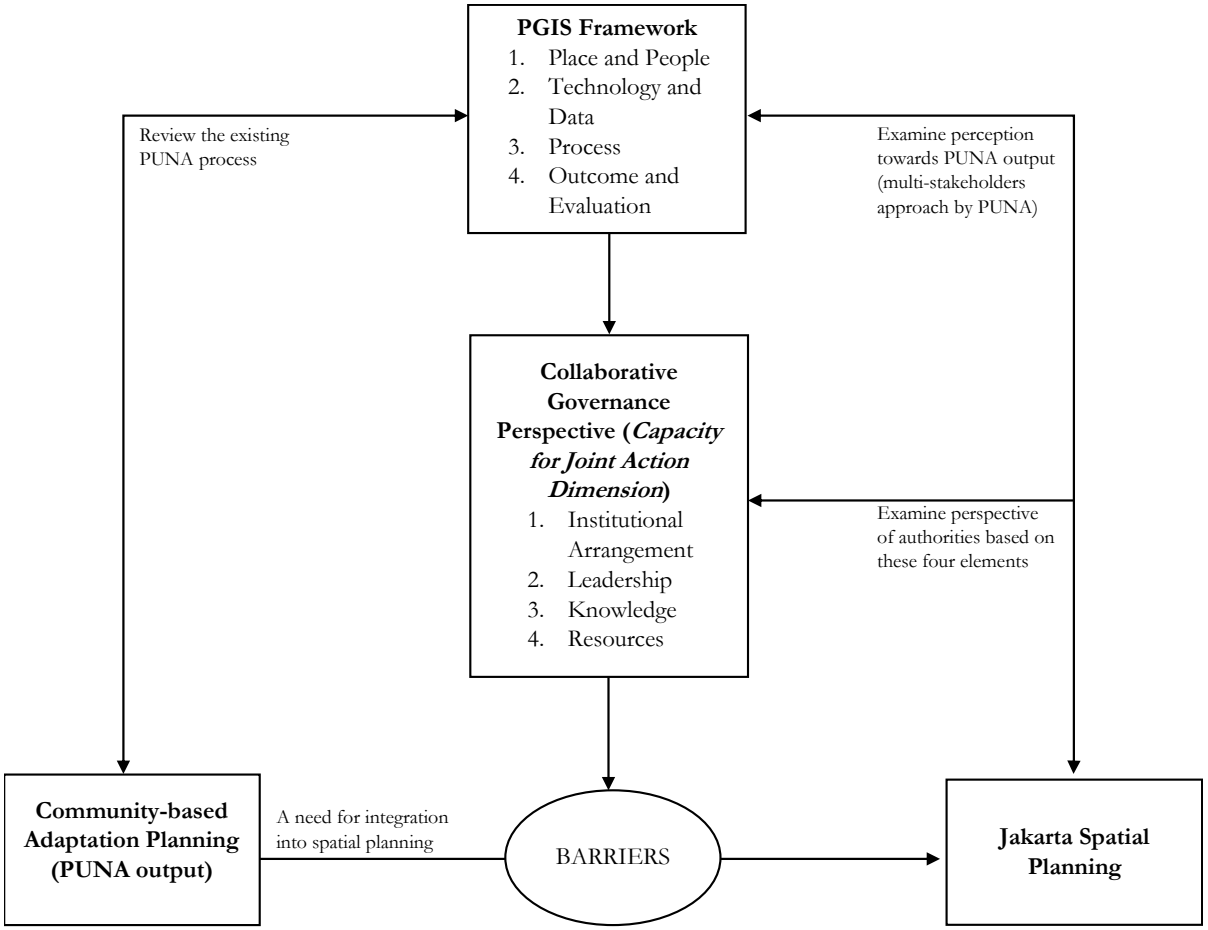

Figure 2. Conceptual Framework of this Research

PGIS framework is relevant to review the existing PUNA process in producing community-based adaptation planning (objective 1) including PUNA multi-stakeholders approach as well as to examine to which extent the PUNA output satisfy the communities and local government geo-information needs (objective 2). Capacity for joint action dimension of collaborative governance framework is relevant to examine to which extent the PUNA output satisfy the communities and local government geo-information needs (objective 2) as well as how PUNA output can be integrated into Jakarta spatial planning (objective 3). This framework is used to structure analysis and discussion of data collection which will be further explained in the next chapter.

3. METHODS

This chapter describes all methods that have been used to obtain the objectives of this research. In this chapter, the researcher, the interviewer, and the moderator are used interchangeably depending on which method that the researcher executed. This chapter contains study area as the introduction of the research case study, research design, methods that consist of semi-structured interview protocol design, semi-structured interview, participatory mapping, photovoice, focus group, and data analysis, and followed by validity and reliability, limitation, workflow of the research, and the last ethical consideration.

3.1. Study Area

Marunda village is one of the urban village located in Cilincing district, North Jakarta, Indonesia. It has a total area of 791.69 hectares and an estimated population of about 29,465 (Statistics Indonesia of Jakarta Utara City, 2017). This village consist of several lands uses such as residential, embankment, industrial, and port. Marunda administration boundary is divided into ten hamlets with 102 neighbourhoods.

Hamlet 7th of Marunda (see Figure 3) consists of 14 neighbourhoods where is adjacent to the estuary of Blencong River on the west side as well as East Flooding Canal (BKT) in the east side. Consequently, community in Marunda faces multiple-hazards risks, i.e. frequent flooding from rivers, tidal waves and high winds. Moreover, Marunda is a densely populated urban village with low-income households. Therefore, this village is not only prone to disaster risk but also has a high socioeconomic vulnerability.

This research was proposed to be conducted in nine neighbourhoods of hamlet 7th in Marunda Village, Jakarta (green boundaries in Figure 3). The selection of study area is based on consideration of data availability, and the involved NGOs have been conducting a participatory approach to build a resilient community, called *Participatory Urban Neighbourhood Assessment* (PUNA).

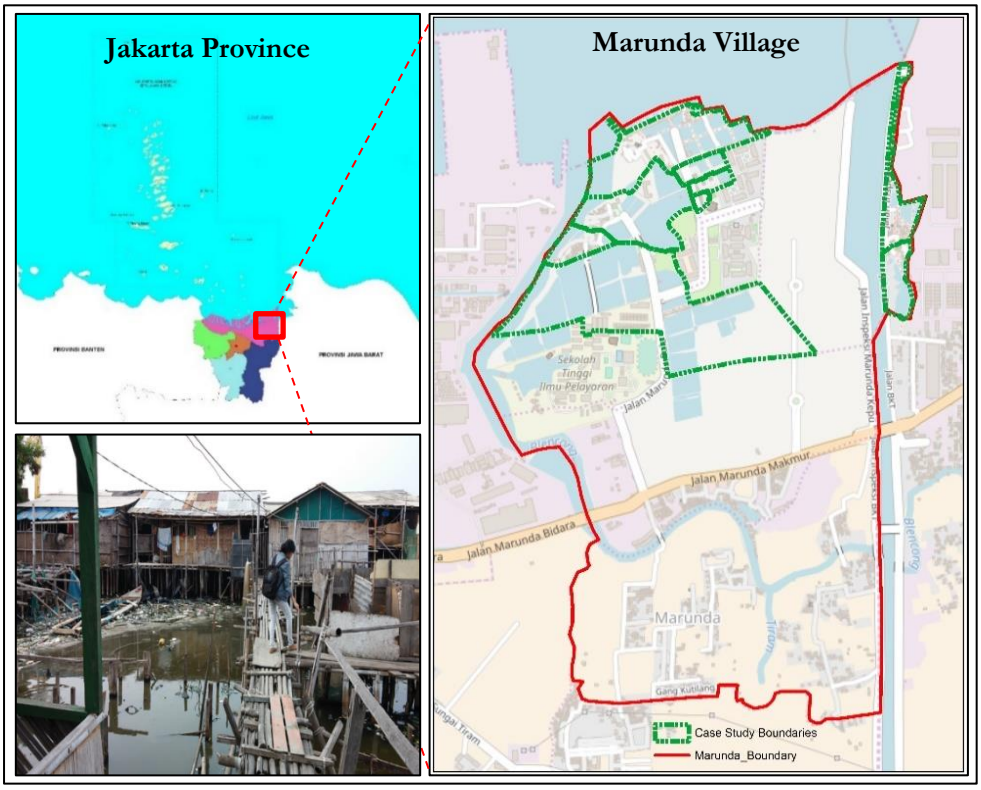

Figure 3. Study Area of the Research

3.2. Research Design

This research was designed to find an appropriate way of investigating an enabling environment for integration of PUNA outputs into spatial planning in Jakarta. This research used a qualitative approach to obtain a better understanding of particular phenomenon which this research tries to reveal. The type of this research is the inductive approach, meaning that the results will be obtained directly from data collection. The research design is a case study design. The study employed conventional survey such as semi-structured interview and focus groups. Several methods were used in purpose to have validity and reliability of data and results.

The analysis methods used content analysis of results from the survey, including both qualitative and quantitative analysis. Mainly data are collected with forms of audio recorded, field notes, and pictures that will be transferred into transcripts to be analysed afterwards. The table below shows overall methods, data analysis, tool requires, and anticipated results based on each specific objective.

Table 3. Data Required and Methods

Specific Objectives	Data Collection Methods	Data and Tools Requires	Analysis Methods	Anticipated Results
To review the existing PUNA process used in building resilient communities in Marunda	Documents review	PUNA Document Literatures	Literature Review	Description of key elements of PUNA Conceptualization of PUNA process based PGIS framework
To examine to which extent the PUNA outputs satisfy the communities and local government needs	Semi-structured Interview Photovoice Focus group Participatory mapping	Field notes Audio recorded Transcripts Maps of PUNA outputs Sketch map	Content analysis (Qualitative and Quantitative)	List of geo-information needs from community and local government Satisfaction of community on geo-information needs of PUNA outputs Satisfaction of local government on geo-information of PUNA outputs
To examine on how PUNA outputs can be integrated to Jakarta spatial planning from collaborative governance perspective	Documents review Semi-structured Interview	Audio recorded Transcripts	Literature review Content analysis (Qualitative)	Perception of local government related to barriers

Table 2 also shows the anticipated results of this research. The anticipated results were obtained from answering research questions. Regarding satisfaction, this research measured satisfaction of PUNA outputs, whether the outputs fulfil the needs of people and local government in building community resilience. Then, by analysing the perception of community and local government related to their satisfaction, it can answer whether the PUNA outputs contain adequate information for community and local government.

3.3. Methods

This research used primary and secondary data. Secondary data were from relevant literature and policy documents. Mainly, this research used primary data that were obtained directly from the community and local government. Collecting primary data, several methods were employed and summary in Table 5. Methods for Research Questions.

3.3.1. Semi-Structured Interview (SSI) Protocols Design

Semi-structured interview protocol is an important element of the qualitative interview. The protocol is designed to meet specific purposes, reduce redundancy and maximise comprehensiveness of SSI process (Gugiu & Rodríguez-Campos, 2007). In this research, SSI protocols were developed specifically, depending on specific questions of this research.

Especially for third specific objective, the variables of capacity for joint action dimension in collaborative governance framework (section 2.4.1) were used. It is as guidance for interview questions and as indicators for finding information about the barriers influencing the integration. The SSI protocols were constructed in English version and translated into Bahasa Indonesia (see in appendices section).The protocols are described further in interview procedures.

3.3.2. Semi-Structured Interview

A semi-structured interview is a powerful and flexible tool to capture the perception of people and make a meaning of their experiences (Rabionet, 2011). This method was proposed to use because it helps to narrow down the areas or topics which this research aims to have (Rabionet, 2011). This method was used to collect data for second and third specific objectives which have a target to community and local government.

In detail, for the second specific objective, the semi-structured interview was conducted to get information about geo-information needs of community and local government (Question 2.1). In parallel, this method was employed to obtain information about whether PUNA outputs contain adequate information for community and local government (Question 2.2) which was supported by deploying image map (participatory mapping technique). In sequence, this method was also used for third specific objective to get local government's perceptions related to barriers influencing the integration using collaborative governance dimensions (Question 3.1).

This method helped to shape a better understanding of barriers which can influence community-based adaptation into spatial planning. For the third specific objective (Question 3.1), the questions or protocols of the interview reflected the variables of *capacity joint for action* dimension. Specifically, questions for the variable of *knowledge* have been formulated and targeted to the community and local government. This was for deriving local spatial knowledge of the community and local government related to Marunda condition. Moreover, variables of *institutional arrangements*, *leadership*, and *resources* have been targeted to local government and chief, as these three variables are associated with government and governmental assistance (chief).

Sampling

The technique sampling for the semi-structured interview with community was purposive sampling. The participants were selected based on three criteria, including (1) considered the variance of perceptions regarding gender and also by means of inclusion, (2) considered representative clearly knowing Marunda as the area of study and the existing problems, and (3) considered the community leader of the study area, in this case is chief. The aim of the sample is to obtain information related to community geo-information needs and satisfaction of PUNA outputs. Then, five respondents were selected in each neighbourhoods (9 neighbourhoods) and a chief of Hamlet 7th of Marunda.

Similarly in semi-structured interview, the researcher also used purposive sampling technique to have participants from local government. The interviews were conducted with representative from local government agencies in Jakarta. The sample selection of respondents from local government was based on their roles in spatial planning and disaster management in Jakarta. The goal of this sample was to explore the barriers influencing integration between community-based adaptation planning and spatial planning in Jakarta according to perspectives of relevant authorities.

The fieldwork was undertaken during September to October 2017 and semi-structured interview was conducted with 45 community respondents, 1 chief of Marunda, and 6 local government institutions. Table 3 describes the sampling of semi-structured interview.

Table 4. Profile of Semi-Structured Interview Participants

Respondents (Gender)	Level	Organisation	Total	Interview Conducted
Community (Male)	Local	-	22	September 2017
Community (Female)	Local	-	23	September 2017
Chief of Marunda Hamlet 7 (Male)	Local	Government Administration	1	October 2017
Head of Evaluation Planning Section (Male)	City	Human Settlements, Land, and Spatial Planning of North Jakarta	1	October 2017
Head of Preparedness and Empowerment (Male)	Provincial	Disaster Management Agency of Jakarta Province	1	October 2017
Head of Sub Division of Spatial Planning (Male)	Provincial	Regional Development Planning of Jakarta Province	1	October 2017
Head of Sub-Division of Economics and Development (Male)	City	Department of City Planning of North Jakarta	1	October 2017
Staff of Evaluation Planning (Female)	Provincial	Human Settlements, Land, and Spatial Planning of Jakarta Province	1	October 2017
Manager of Resilient Jakarta Secretariat (Female)	Provincial	Government Organisation of Resilient Jakarta Secretariat	1	October 2017

Interview Procedures

The interview was guided by protocols that have been developed based on the second and third specific objectives of the research. Specifically, the questions for community covered three types of questions, including (1) basic information (demographic) – to understand respondents' background relevant to social vulnerability, (2) geo-information needs on risk and vulnerability – to explore the types of hazards and their impacts to socio-economic and environment aspects in Marunda, and (3) geo-information needs on coping and adaptation – to measure the coping and adaptation strategies of community towards hazards impacts. In addition, the interviewer also employed participatory mapping technique in this semi-structured interview process. This technique will be described more in participatory mapping section, and the interview guidance can be seen in appendix 1. On the other hand, the questions for chief was developed related to his role and

responsibilities as the government's accomplice in connecting government with local community. The questions can be seen in appendix 2.

Moreover, interview with local government was divided into two phases. The first phase, interview was conducted for exploring their perceptions about the barriers that can influence the integration of community-based planning into city spatial planning. The interview protocol in phase one was framed according to the elements of capacity for joint action dimension of collaborative governance, such as institutional arrangements, knowledge, leadership, and resources. The protocol also can be seen in appendix 3. The second phase was executed by photovoice method that will be explained further in photovoice section.

Interview Process

Initially, the researcher explained the purpose and the objective of the semi-structured interview to the respondents before commencing the interview. After respondents understood the overview of the interview's goal, the researcher continued asking a consent for approval of involvement in interview process. The researcher also made a declaration that all information only be utilised for the research objectives and not for any other purpose.

There were 45 respondents in Marunda community, 1 chief, and 6 local government institutions that have been participated in the semi-structured interview. The process of interview with local government, community and chief acquired time about 20 – 30 minutes. Map bellow illustrates the distribution of 45 respondents of community within nine neighbourhoods in Marunda.

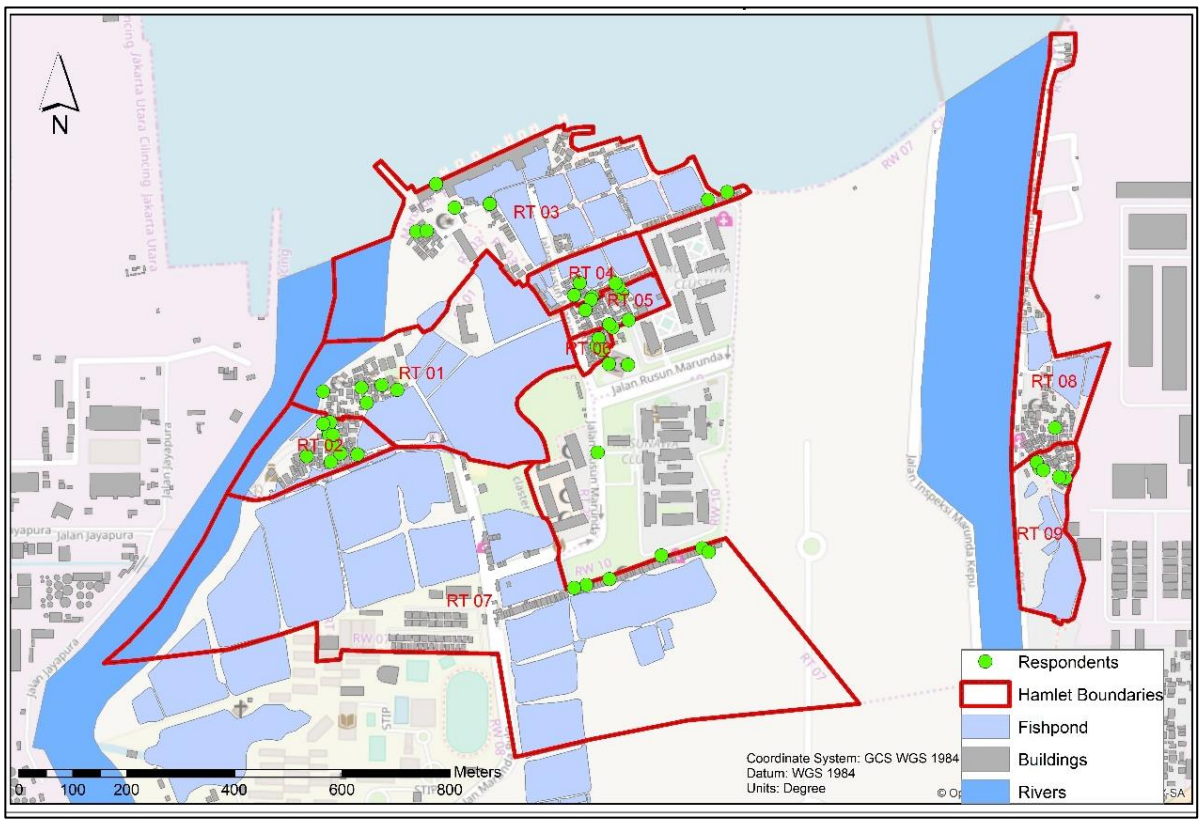

Figure 4. Distribution of Semi-structured Interview with Community in Marunda

3.3.3. Participatory Mapping

As mentioned in interview procedures section that participatory mapping was conducted to each respondent during the semi-structured interview, also in focus group discussion. This method was used for obtaining information related to geo-information needs of community. For instance, respondents were allowed to draw the location and magnitude/extend of hazards impact. In addition, respondents also drew evacuation routes as they perceived as shortest routes as well as locations which they perceived as safe places to be emergency shelters. This method would deliberately fall in help of answering second specific objective; satisfaction of PUNA outputs (Question 2.2). Then, result of participatory mapping in both semi-structured interview and focus group would be compiled and analysed to have reliable information toward representation of local spatial knowledge. The result of participatory mapping in FGD can be seen in appendix 4.

Participatory Mapping Procedures

In semi-structured interview with community, the researcher employed image map with size A3. The map was showed to each respondent and the respondent was allowed to draw information based on interviewer's questions. Other equipment such as colour markers and annotation were used to designate the information which has been given. Similarly, the researcher also used image map with size A0 to accommodate all participants in focus group discussion. Participatory mapping technique in focus group will be explained more in focus group procedures.

3.3.4. Photovoice

Photovoice is one of qualitative approach that blend narrative with photography to explore community issues (Nykiforuk, Vallianatos, & Nieuwendyk, 2011). Similarly, photovoice is a process that supports people to identify, represent, and enhance their community using photographs (Wang & Burrish, 1997). According to Wang and Burrish (1997), participants can share photographs through focus group discussion as well as semi-structured interview (Castleden, Garvin, & First Nation, 2008). This research used this method to answer second specific objective. However, since PUNA outputs themselves are in the form of maps, so for, this research, this method did not employ such photograph, but it used maps of PUNA outputs to be discussed by the community and local government. As such, this method was able to help answer whether PUNA outputs contain adequate information (Question 2.2).

Photovoice procedures

This method was adopted in the process of an interview with local government as well as in focus group discussion with key informants in Marunda. In the process, the interviewer applied online maps of PUNA outputs from the website (https://openstreetmap.id/muria) in the focus group and the interview. The researcher used projector tool to execute the process in focus group discussion in order to have a conducive process (see Figure 5). Participants discussed related topics based on interviewer's protocols. The protocol can be seen in appendix 4. Further explanation for photovoice process will be described in the subsequent section; focus group procedures.

Figure 5. Photovoice method in FGD Process

3.3.5. Focus Group

In this research, a focus group was organised to get overall perceptions of PUNA outputs from key informants in the community which regard to the second specific objective (Question 2.2). This is for collecting common perceptions of multiple individuals simultaneously (Onwuegbuzie, Dickinson, Leech, & Zoran, 2009). It intends to take approximately 1 to 2 hours to have an effective designed group (Morgan, 1997) and consist of 6 - 12 participants that will produce a reliable data (Langford, Schoenfeld, & Izzo, 2002). The technique sampling for this method was snowball sampling. The NGO member helped to invite key informants in Marunda.

Focus Group Procedures

Focus group discussion was divided into three phases. The first phase, the moderator conducted participatory mapping method to probe local spatial knowledge related to information on vulnerability and hazards identification. Image mapping (A0 size) was used to support participants identifying the issues related to interviewer's questions. The second phase, the moderator displayed online maps from the website (https://openstreetmap.id/muria) of PUNA outputs. Photovoice method was applied in this phase to bring a critical discussion to information on the online maps. The FGD was conducted with six participants and took about two hours of the process. Table below summarises all methods of this research based on research questions.

Table 5. Methods for Research Questions

Methods	Research Question
Semi-Structured Interview (SSI)	▪ Question 2.1 ▪ Question 2.2 (with participatory mapping method) ▪ Question 3.1
Focus Group	▪ Question 2.2 (with Photovoice method and participatory mapping method)

3.3.6. Data Analysis

In this research, an analysis method that used was content analysis. According to Moretti et al. (2011), content analysis is referred as a method to classify the subjective interpretation into identified categories of similar meaning or patterns. Hsieh and Shannon (2005, p. 1278) also argued that content analysis can be defined as "a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identify themes or patterns". As such, considering the data collected in this study is mainly qualitative and exist in the form of transcripts or field notes, then it is necessary to analyse them by classifying into clear categories, resulting in better meanings and patterns.

In this study, content analysis consists of quantitative and qualitative approaches including document literature. Although the use of quantitative approach in the content analysis was criticised because it often simplifies the text into the quantifiable unit (Cho & Lee, 2014), but it also helps to understand the contextual use of the words of content. According to Hsieh and Shannon (2005, p. 1283), "the quantification is an attempt not to infer the meaning but, rather, to explore the usage".

Data Analysis Process

This research follows an inductive approach in which the results are directly derived from specific data and uses it to obtain a broader understanding of particular phenomena (Lichtman, 2014). This research data is mainly from the semi-structured interview. Costa, Reis, Sousa, and Moreira (2017) recommend the use of Qualitative Data Analysis Software (QDAS) to systematically and ease to handle large volumes of data. All interview data were transcribed and made list coding as the initial coding. This list coding is the summary of ideas from participants' answers. The proceeding step is the coding process that makes use of Atlas.ti version 8.0 software. Transcriptions were then uploaded into the software. The researcher also made additional coding in open coding while detecting new ideas. Transcriptions were analysed systematically by quoting and putting the coding based on predefined coding.

Succeeding the coding process, the list coding was grouped based on similarity then leads to specific categories that regard to particular objective of this research. The use of network analysis is necessary to help better understanding of the coding. The meaning of the categories reflects broader concepts that were then described using content analysis. Figure 6 illustrates coding process and data analysis steps for semi-structured interview data.

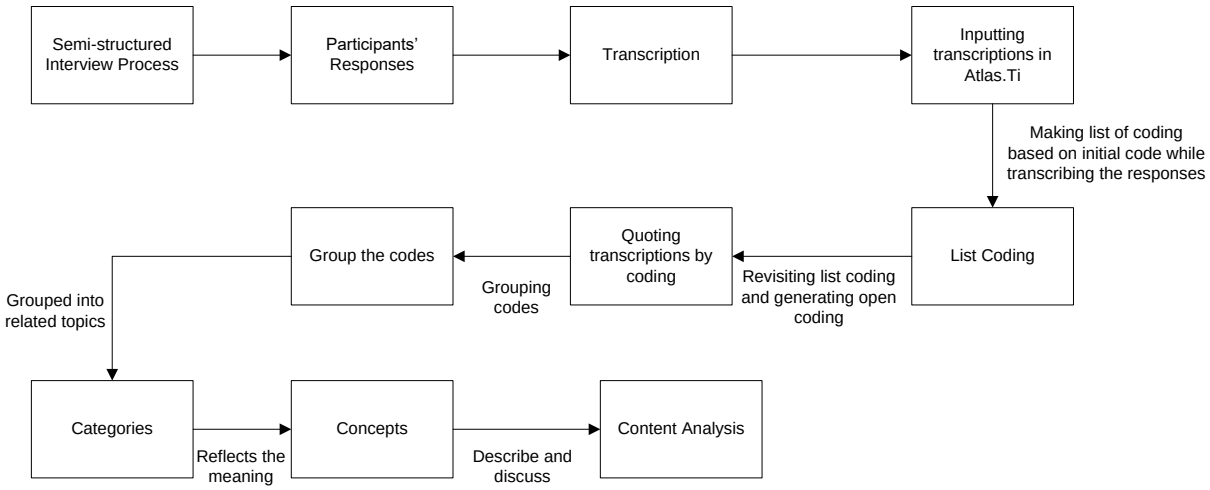

Figure 6. Coding Process and Data Analysis Steps for Semi-structured Interview.
Adopted: Sunarharum (2016)

3.4. Workflow

In order to investigate an enabling environment for the integration of PUNA outputs as community-based adaptation planning into spatial planning in Jakarta, some social science approaches and methods are proposed. Figure 6 below shows an overall work plan of this study. The process has been divided into three phases, namely pre-fieldwork, fieldwork, and post-fieldwork.

Figure 7 shows that during the pre-fieldwork, the identification of PUNA process and collaborative governance indicators were defined mainly by research desk. In fieldwork, the evaluation of PUNA outputs was obtained through a semi-structured interview with both community and government, and focus group with the community. In post-fieldwork, all data that have been collected from fieldwork were analysed to answer all research questions of this research.

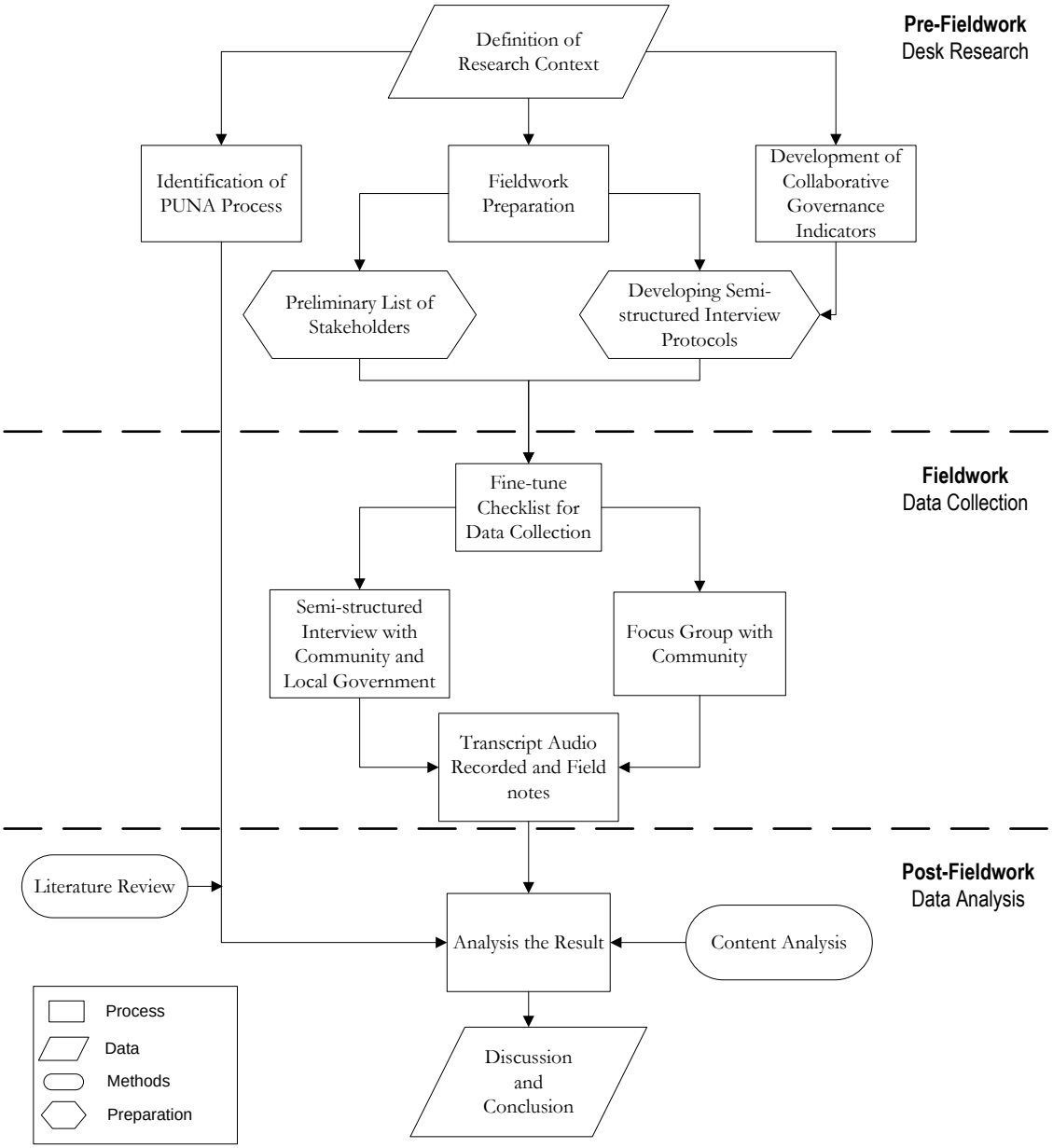

Figure 7. Workflow of the Research

3.5. Ethical Consideration

This research considers the ethical issues highly in the process of data collection and results. Since the data (primary data) mainly were collected from the community and local government through several methods which were proposed in this research, the researcher asked for participants' consent before conducting the data collection. The profiles of respondents who participated in data collection process were anonymous regarding privacy considerations. In addition, the secondary data which are collected from non-governmental organisations (NGOs) will be used only for research objectives and not for any other purposes. The data will be acknowledged and referenced to the source of information in the final document.

4. INVESTIGATING ENABLING ENVIRONMENT FOR THE INTEGRATION OF PUNA OUTPUT INTO JAKARTA SPATIAL PLANNING

This chapter describes the results of the analysis as well as discussion of three specific objectives of this research. It intentionally follows the order of specific objectives to lead story to the main objective of the research. It starts from reviewing the existing PUNA process (Sub-objective 1), to which extent PUNA outputs satisfy community and local government needs (Sub-objective 2), and what constitutes an enabling environment through which PUNA outputs can be integrated to Jakarta spatial planning from collaborative governance perspective (Sub-objective 3).

4.1. Reviewing the Existing PUNA Process used in Building Resilient Communities in Marunda

Several documents related to PUNA (Cordaid, 2015, 2016, 2017; Santosa & Maria, 2015) have been studied to describe the key elements of PUNA as well as to review the process based on PGIS framework. Researcher observation was utilised to strengthen the results. The documents that were reviewed such as PUNA reports and MURIA project reports. In addition, observation and some discussions with the facilitators from September to October 2017 in Marunda were purposively used to enrich the results.

4.1.1. Key Elements of PUNA Process

PUNA is a method that the involved NGOs conducted in pertaining the project of strengthening the community in Marunda towards community resilience. According to the analysis, PUNA has four key elements; to promote empowerment, to build local ownership, to improve gender equality, as well as to build positive relationship within all stakeholders to collaborate within the addressed joint agenda in Marunda.

Using Cordaid's resilience framework with its six components, Marunda community was set up as the basic element to promote empowerment and local ownership. It is reported that community was participated in providing the local information, analysing their own risks and vulnerability to take actions which fit their context and capacities. Further, PUNA improves gender equality. Based on documents reviewed (Cordaid, 2015, 2017) and observation, women were more involved compared to men. Furthermore, PUNA emphasised the process by identifying potential stakeholders from the Marunda community and outside the community to identify the priorities to follow-up to establish the joint agenda which will enable the MURIA project to have a multi-stakeholders collaboration in accordance with the responsibility of each government institutions, private sectors, academicians, and grassroots communities to deliver the joint agenda of strengthening urban resilience to further achieve the goal of the project.

4.1.2. Description of PUNA Process using PGIS Framework

a. Place and People

PUNA was carried out in nine neighbourhoods of Marunda which are from neighbourhood 1 to neighbourhood 9. These areas are congested urban village in which there are many unsanitary housings and have a potential to coastal flooding in consequence of the plain is lower than the sea surface. It is also bounded by a river called Blencong (part of Cakung watershed). Currently, Marunda is surrounded by industrial and warehousing which it used to be agricultural and fisheries in the past. As such, the current marine condition in Marunda appears impossible to let fishermen sail due to the sea has been contaminated with industrial disposal.

On the other hand, as explained in study area section that Marunda has a population approaching 30,000 in 2017 and it is populated with low-income households. Based on interview sample (45 respondents) illustrates that a high portion of the male respondents (22 out of 45 respondents) are fishermen. In addition, respondents of the female also are mostly housewives (23 out of 45 respondents). Regarding the current sea condition, mostly fisherman changed their occupation to such as securities and labours. One of the male respondents said, "*I sometimes work as construction labour. I used to be a fisherman. Since now to be a fisherman is very difficult, less income, dirty sea, so that I just do what I can do now like to be labour*".

Furthermore, originally people in Marunda are Betawi culture background. It is proved by the existence of two Betawi culture icons named The House of Si Pitung and Al-Alam Mosque. Both icons are well known as regional tourism site in North Jakarta. Nowadays, Marunda is populated with many different cultures such as Java, Bugis and Batak which dominate the cultures in Marunda, thus considered immigrants by local government. This mixed-cultures influences development of Marunda. As one of the government institutions said, "*Peoples in Cilincing*[4] *do not have awareness yet, so eventually they do not maintain their environment. They are mostly immigrants*". Similarly, various characteristics of people from different ethnics background in Marunda lead to a complex approach to engaging people in PUNA. The facilitator member said, "*Peoples in here are different with peoples in rural. In here, they are very difficult to be invited in this process*".

People who participated in PUNA were men, women, elderlies, youths and fisherman community. Elderlies were involved in describing the history of Marunda related to historical of hazards which frequently occur in Marunda. Whereas men and women together with facilitators identified their socio-economic and environmental vulnerability through participatory mapping method using image maps. Youths also were engaged in updating socio-economic and environment information spatially through the online-based map in which the facilitating NGOs have provided.

Figure 8. Participation in PUNA process. Source: Cordaid

The stakeholders that engaged in PUNA process have various interests depend upon their roles and functions. The PUNA process was initiated by three non-government organisations in which Cordaid is an international NGO funded the program, then *Bina Swadaya Konsultan* and *Karina KWI Yogyakarta* as local NGOs executed the program on the ground. The three NGOs involved other local NGOs to take part in the program to promote multi-stakeholders approaches such as YTBS and Humanitarian OpenStreetMap Team. Local government also participated in the program to control the participatory process within Marunda. Furthermore, the involvement of related government institutions at the provincial level was established to expand the collaboration. The stakeholders that engaged in PUNA process will be summarised in the table below. The role, interests, resources of the stakeholders are listed.

[4] Cilincing is one of districts in North Jakarta in which Marunda administratively located.

Table 6. Summary Description of PUNA Stakeholders

Public	Role/Function	Interests	Resources
Cordaid	Support and monitor the project	Strengthening community; building resilience for community	Finance; Facilitator
PT. Bina Swadaya Konsultan	Presents and organises PUNA activities	Strengthening community; building resilience for community	Facilitator
Karina KWI Yogyakarta	Presents and organises PUNA activities	Strengthening community; building resilience for community	Facilitator
Yayasan Bina Tani Sejahtera (YTBS) (which later became EWINDO due to changing of working areas of YTBS)	Presents and organises PUNA activities	Strengthening community; building resilience for community	Technical support
Chief (Hamlet 7th)	Authorise access to all resources; monitor; security	Support the activities	Limited political power
Fisherman community	Participate in PUNA		Local knowledge
Local Administration (Kelurahan Marunda)	Provide access to all resources; monitor; security	Legal permission; peace	Political power
Humanitarian OpenStreetMap Team (HOT)	Support PUNA activities	Build capacity for youths to make online map	Technical knowledge support of making maps
City Disaster Management Office (KPBK) of North Jakarta (currently it is merged with provincial BPBD)	View and support PUNA process	Obtain community-based preparedness-measures strategic	Collaboration in mitigation plan
Disaster Management Agency (BPBD) of Jakarta Province	View and support PUNA process	Obtain community-based preparedness-measures strategic	Collaboration in mitigation plan

b. Technology and Data

It is reported (Cordaid, 2015, 2017) that technology GIS as experienced in Marunda was conventional instruments that used to obtain spatial information from the community such as participatory sketch mapping, historical timelines and transect walk. In the process, sketch mapping was provided to attract participants identifying their socio-economic and environmental conditions as resources collection. This method was executed in focus group discussion. In sequence, participants and facilitating organisations conducted transect mapping to identify the best routes and locations for evacuation routes and emergency shelters respectively. This method was supported by GPS tools. All information was put in OpenStreetMap platform to show the existence of Marunda that has never been shown before. In addition, this information also has been integrated into Ushahidi platform in order to encourage the community to update their conditions related to hazards impacts.

Ushahidi as an affordable open mapping platform that NGOs chose to accommodate the spatial information that might help Marunda community to minimise hazards impacts as community-based adaptation plan. As for, the website contains information such as a number of vulnerability groups in each neighbourhood, locations of hazard (coastal flooding), evacuation routes, and emergency shelters. The production and availability of thematic maps also might help community to participate in the development planning. In addition, community can update their activities which associated with improving the livelihood such as urban farming, waste bank, and joint business in savings and loans (UBSP) as well as hazards occurrence which may happen unpredictably. This aims to help community to have a better preparedness against hazard impacts.

Regarding technology which supports the information, community provided data and information which were relevant to six component of Cordaid's resilience framework. Table 6 describes the data.

Table 7. Information that community provide in PUNA process

Cordaid Resilience Framework					
(1)	(2)	(3)	(4)	(5)	(6)
Risk Element	**Basic Needs**	**Livelihood & Health**	**Ecosystem**	**Community Structure & System**	**Policy**
• Vulnerability groups • Type of hazards • Historical occurrence of hazards • Hazards frequency • Hazards locations	• Foods • Water • Sanitation • Housing	• Types of occupation • Daily activities	• Historical area of Marunda • Land use changes	• Community networks	• Issues

c. Process

1) System Implementation and Sustainability

Based on the analysis of relevant document (Cordaid, 2015), PUNA implemented two basic approaches with several phases to probe social, economic, and environmental conditions of Marunda and produced the principal PGIS outputs such as sketch map, boundary map, distribution of hazards occurrence, and preparedness plan map. The first phase, facilitators initiated an approach to community through reviewing the secondary data; the second phase mainly engaging community in identifying challenges and opportunities of the current condition of Marunda; phase three facilitating NGOs together with community analysed information using resilience framework as well as identification of collaboration opportunities with stakeholders to build community resilience; the last phase mainly about youths participation in mapping process.

In the **first phase**, the facilitating NGO reviewed Marunda condition through demographic data as well as conducted field observation to enrich the information. This phase was conducted without community involvement. In this phase, the facilitating NGOs produced some basic information which used for the second phase.

Once basic information was established, in the **second phase**, the facilitating organisations carried out qualitative and quantitative approaches to start collecting data. The objective of the second phase was to describe Marunda history over the year and to identify the strengths and the weaknesses of the community. The facilitating NGOs initiated the involvement of communities as actors for collecting, analysing, and producing information in regard to have community-managed plan related to preparedness measures. In the qualitative approach, the facilitators analysed socio-economic phenomenon through in-depth interview with community and household surveys. After all information in the qualitative approach had been collected, then the facilitator initiated the participatory approach. The participatory approach was conducted through focus group discussion, to identify the boundary of neighbourhoods, distribution of public facilities as well as a phenomenon related to hazards impacts.

The participants in the participatory process (in the second phase) were men, women, elderlies and fisherman community. At the first stage, they identified disasters that occurred over the last 30 years in Marunda based on their experiences. Elderlies' knowledge and experiences were considered vital to reveal the history of Marunda related to urban development and climate change. The facilitators provided five problems categories including hazards occurrence, environmental degradation, infrastructure development, demographic, and housing development plus facilities to thematically map the challenges which influence the development in Marunda. They were needed to describe each problem, then they were divided into several groups. Each group had one category or problem. After all participants were split up, then they analysed the problem. They used an image map and other annotations to draw the problem as well as they made timelines to structure the occurrences or the changes of phenomenon of each problem. For instance, the group of hazard occurrence, the members described the magnitude of the hazards impact, locations as well as the time of the occurrence (monthly or yearly). Figure 9 shows local spatial knowledge that has been processed and digitised by using GIS software. In Figure 9 presents some arrows, indicate water flow direction that comes from ocean and river and the yellow dash polygons represent inundation.

Figure 9. Result of Participatory Mapping in FGD. Source: PUNA Document

Thereafter, in the **third phase**, all participants identified their strengths and weaknesses to adapt to those core problems regarding the facilitator's resilience framework. The facilitators stimulated participants by providing image cards contain various types of capacities. Then, participants analysed those types of capacities which can reflect on their abilities. Further, they described their abilities and capacities with how they are able to cope and adapt to the identified problems. For instance, they have abilities to recycle and reuse the solid wastes to produce handicrafts, they are able to do farming, and manage their economies through joint business in savings and loans. Once the ability and capacity of community were defined, the next stage was that all participants together with facilitators mapped local government by which be able to help community response to the five problems. They made a list of government institutions which are relevant to accommodate the five problems.

The GIS outputs were done during the participatory practice in phase two. To finalise the output, in the **last phase**, youths in Marunda were involved in tracking the best routes for evacuation routes plan. They were trained using GPS tools by the facilitators. Subsequently, the facilitator disseminated the knowledge by utilising the online-based map. The NGOs used Open Street Map (OSM) to show the existence of Marunda (Figure 11), and then they integrated this information into Ushahidi platform to report the community activity development related to preparedness-measures in Marunda. The youths were facilitated to make maps, upload the maps into web-based map, and also update the information (Figure 10). Youths are mandated to sustainably update the information. For example, the youths collect the information directly from community members. Once the information has been obtained, they transfer the information to the provided website. The information will be validated by facilitators to produce trusted information.

Figure 10. Youths were contributed in uploading information into web-based map. Source: (Santosa & Maria, 2015)

Figure 11. Marunda Map before and after PUNA. Source: (Santosa & Maria, 2015)

2) Participation and Communication in Policy-Making Process

Based on document reviewed (Cordaid, 2015, 2017; Santosa & Maria, 2015), in PUNA process there has been identified several relevant local government institutions to collaborate in building a resilient community in Marunda including Provincial Disaster Management Agency of Jakarta (BPBD) and City Disaster Management of North Jakarta (KPBK). Further, the involved NGOs facilitated the establishment of coordination and discussion through forum or workshop (Figure 12). The aim was to mainstream local spatial knowledge towards community-based adaptation planning against climate change and disaster impacts in Marunda. It is reported that BPBD and KPBK accepted the community-based adaptation plan based on substantiation by which Marunda community have produced in PUNA process. The plan itself contains disaster management, urban farming, and waste management.

Figure 12. Communication process facilitated by City Government of North Jakarta. Source: (Santosa & Maria, 2015)

Figure 13. Workshop for Action Planning Development MURIA Platform on September 2017. Source: Direct Observation 2017

Then, on September 2017, the involved NGOs established a communication for the action planning development through a workshop (Figure 13). It was the last agenda of the project to sustainably coordinate as well as collaborate with the local government. The participants were representative of Marunda community who dominated by women and Jakarta government institutions such as BPBD, KPBK, DKPKP, and governmental organisation of Resilient Jakarta Secretariat. In this workshop, the facilitators wanted to review certain opportunities that can be made for plans in order to strengthen a resilient community's initiatives. One of the participants from government institutions said, "*we hope that we should always be coordinated to sustain this development*". In addition, other government institutions representative stated, "*Deputy of Jakarta Governor for Spatial and Environmental Sector proposed a collaboration approach […] there are eight grand designs that Jakarta government still developing and one of them is disaster risk reduction grand design. On behalf of Resilient Jakarta Secretariat, we would like to invite Marunda community together join in establishing a strategic plan for Jakarta, and this project can be used as a pilot for other areas in Jakarta*". This quote indicates the government of Jakarta has just initiated to mainstream disaster risk reduction in policies and PUNA process provides a positive effort as a bottom-up approach to collaborate in policy-making processes.

Further, the Integrated Risk Management Approach (integration of Disaster Risk Reduction, Climate Change Adaptation and Ecosystem Management and Restoration) used in the MURIA Program has been adopted into the Jakarta government policy especially in the Jakarta Urban Farming Grand Design which has been initiated by MURIA since February 2017. The grand design is one of the grand designs established by the Jakarta government to support the Resilient Jakarta Program.

d. Outcome and Evaluation

It is reported (Cordaid, 2017) that commence from August 2015 to December 2017 Marunda community have finished production and availability of thematic maps through integration between OpenStreetMap with Ushahidi platforms (see Figure 14). The maps consist of preparedness-measures information as well as other activities which are related to capacity building for the community. The Web-GIS platform by which the NGOs used enable community to report particular events in association with information categories (see Table 8) regularly. Table 8 describes all information that Marunda community produces during PUNA process.

Table 8. Digital Information in https://openstreetmap.id/muria/. Updated: November 2017

Information Categories							
Urban Farming	**Dangerous Location**	**Preparedness**	**Community Learning Centre**	**Culture**	**Social & Economic**	**Partnership**	**Preparedness-measures Plan**
Demo Plot (Collectively)	Events	Evacuation shelter	No information	Culture sites	Waste bank	No information	Water monitoring point
Urban Farming Individual	Inundation points	Disaster information points		Art community	UBSP		Flooding area
Urban Farming Training	Pest	Preparedness activities		craftsman	craftsman		Neighbourhood boundaries
	Cyclone	Preparedness training		Cultural training	Shell Peeler		Evacuation routes
	Coastal Flooding				Community-based organisations		Emergency shelters
	Water crisis				Groceries		Vulnerable groups
	Wastes				Social & Economy Training		

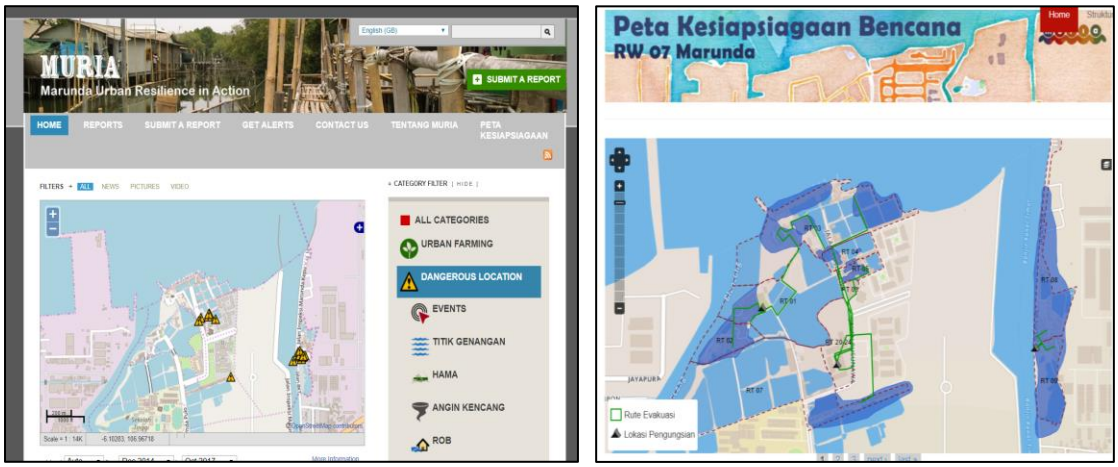

Figure 14. Digital Outputs of PUNA. Source: https://openstreetmap.id/muria/

In general, this process has produced inclusivity of Marunda community entities. It is observed that PUNA activity has encouraged community, especially women to take parts in creation initiatives to increase their livelihood such as in urban farming activity (Figure 15). Based on the testimony of one of PUNA participants, "*MURIA has made women can make a group to make people around love to saving, UBSP for example. Also, many mothers dare to speak up*". In addition, a small number of youths also established a team to encourage them to understand the use of GIS as a communication tool. As one of GIS team member stated, "*I do not know at all about the map. After being part of the Map Team, taking part in the training, and engaging in many map activities, I now understand the importance of the map, and I am also proud that Marunda is already on the map and Marunda*

activities can be seen through the map". Moreover, the involved NGOs also enlarged the collaboration with other local grassroots organisations to provide a joint agenda in building Marunda community resilience. This as means for deriving a multi-stakeholders approach as their one of the key element of the project.

Figure 15. Community shows the harvest of urban farming activity. Source: Direct observation, 2017.

4.1.3. How PUNA is Building Resilient Community in Marunda

a. Place and People

Successful public participation is contextually determined by place and people (Sieber, 2006) that should be highly recognised concerning local community knowledge (Harris, 2016). It is closely related to the cultural aspect that can shape the acceptance of the process. In a context of Marunda, as mentioned before that Marunda urban village is located in the coastal area, which is also surrounded by industrial activities. The PUNA process was actually taken place in the context of the situation in which land tenure issues, such as land insecurity exist. As a researcher observation as well as the interview with government institutions, they avoided revealing the land tenure issues since it will disclose other problems. Hence, it is a crucial challenge for local government and NGOs that have to be taken into account land tenure status when obtaining and implementing public participation to build adaptation plan in urban low-income settlement (Archer et al., 2014).

In relation to cultural, Sieber (2006) stated that place carves the social characteristic, so as the current condition of Marunda shapes characteristic of people who reside. This issue has brought the perception of people in providing and sharing the local information. It is proved by NGO member, found difficulty in engaging people to participate in PUNA process. It may because of the mix-cultures yields complex characteristics which affect their tolerance of expert solutions (Carver, 2003; Sieber, 2006). In addition, it is also worsened by environmental degradation of Marunda that affects community livelihood, triggers them to feel anxious to welcome such development activities and then leads to community resistance to participate. This situation will produce lack of commitment to sustaining the initiatives within community itself (Chirenje, Giliba, & Musamba, 2013). Verplanke et al. (2016) reminded that trust is something that facilitators need to share in order to engage community in public participation. The facilitating NGOs tried to approach community by studying the secondary data and observation (further explanation in 4.1.2.5). As a result, the facilitators could execute the process.

On the other hand, it is seen that there is no gender inequality in Marunda community. It is contrasting with the case Búzi, Mozambique from Kienberger and Steinbruch (2005) in section 2.2.2. that culturally, women in Marunda were treated as same as men in issuing opinions, where they were blended in one place to share the local information. It is a benefit to the involved NGOs or practitioners to be able to involve women in the process. However, in an economic perspective, based on observation, women tend to lack ability and capacity in producing income (Langowitz & Minniti, 2007). They very much rely on men or their husbands to fulfil their daily needs. The interviews showed, mostly females respondents are housewives, and just a few of them made a stall attached to their house as a small business to support their living. Regarding the goal of building a resilient community, the PUNA process successfully managed the involvement of women. As a result, women are able to manage their livelihood through urban farming, waste bank, and joint business in savings and loans (UBSP).

Regarding the stakeholders engagement, according to Sieber (2006), the involvement of multiple levels of stakeholders will ensure the sustainability. Based on the list of stakeholders in prior (Table 5) showed the variance of interests that range from cooperation, compliance, collaboration and to control. It is defined that the collaborative approach in PUNA process was highly considered by the practitioners to obtain the desired state of the project. However, it should be remembered that adding a broad range of stakeholders also add another complexity since each of them has set of priorities (Sieber, 2006; Verplanke et al., 2016). There should be a clear distinction between tasks and responsibilities in one goal. The involved NGOs engaged the potential stakeholders to make a joint agenda in order to derive the purpose of the project such as Provincial Disaster Management Agency (BPBD) and Provincial Food Security, Marine, and Agriculture Agency (DKPKP). However, in the end, it should be ensured that all stakeholders are stick to what has been agreed to build a resilient for Marunda community.

b. Technology and Data

The option of the usage of GIS technology considerably determines the accessibility and the dissemination of data (Sieber, 2006). The low-tech approaches to PUNA practice have used, showed effectively engaging Marunda community to share their spatial knowledge. Yet, considering OpenStreetMap and Ushahidi platforms that have been using for publishing the existence of Marunda and reporting the Marunda condition related to hazards occurrence and community activities respectively, show imbalance if it is linked to the community's ability as the majority they did not know how to access the internet (Rinner & Bird, 2009). According to Sieber (2006), there are still many stakeholders are marginalised by the use of web-based map, for example, elderly people. As the observation showed a high portion of adults to elderly in Marunda in which correlate with the interviews responses that they do not know how to access the internet. Therefore, it will simply look at it as unusable if the spatial information can only be accessed by the community who acquire or know how to access the internet. Although with these platforms enable the community-based adaptation planning has more extensive chance to be communicated into the decision-making process.

c. Process

The PUNA process is similar to with public participation that had been conducted in India to build community resilience (section 2.2.1). In which the practitioners incorporated local spatial knowledge related to disaster risks and climate change adaptation. The added value of PUNA process is that the practitioners concerned the daily needs and livelihood aspects as fundamental components in building community resilience, analysing the challenges and opportunities of the aspects, then turning them into activities that could help community to be locally better adapt to disaster risk in respect to economic resilience. Further, the methods that both practices employed were also similar such as FGD and household survey. Regarding

the role of community, both practices put community as actors who provide information, analyse the information, to deliver the outputs into the decision-making process.

It is also similar to the case of Búzi, Mozambique by Kienberger and Steinbruch (2005) (section 2.2.2) in which data had been collected through secondary data and interviews methods. Yet, the weakness of Marunda community itself as a comparison with the case of Búzi is that they could not use maps even for reading the maps, while community in Búzi had understood the use of maps. Therefore, the understanding of maps usability could increase community capacity to prepare and adapt to possible hazards impacts.

Furthermore, the option of GIS technology such as Ushahidi and OSM platforms influences information sustainability to build a resilient community (Shanley, Burns, Bastian, & Robson, 2013). The technology provides community near real-time the possibility to report the hazards occurrence in their areas (Goodchild, 2007; Shanley et al., 2013) as well as the technology is affordable for developing countries (Sieber, 2006). In order to have the web-based GIS platforms, the involved NGOs engaged GIS expertise (HOT Team) to help community to transform their spatial knowledge in a more inclusively transparent way of communication. However, Sieber (2006, p. 499) reminded that "support network is likely to be informal and fragile and fail to ensure the long-term sustainability of the GIS". As such, the involved NGOs tried to teach community, especially youths in order to have basic technical skill in using OSM and Ushahidi which do not need high technical skills (Brandusescu, Sieber, & Jochems, 2016). At least, Marunda community itself has to know how to acquire, implement, and maintain GIS to sustain the spatial information.

Regarding the way of the community to communicate their adaptation planning, it showed a positive effort. In which the facilitating NGOs established workshop or socialisation with several government institutions to set the joint agenda that suit with particular tasks and functions of those government institutions. This effort might produce certain appropriate coordination and communication. However, concerning the government institutional structures and varied interests among institutions, the community has to endeavour to mainstream their initiatives (Wijaya et al., 2017). Although the PUNA process has promoted a multi-stakeholders approach which is a promising approach to build resilience for community (Archer et al., 2014; McBride et al., 2017; Measham et al., 2011; Sieber, 2006; Wijaya et al., 2017), yet it is back again to stakeholders themselves whether they have awareness and willingness to attempt to build a resilient community. Further, notwithstanding the involved NGOs have successfully engaged BPBD and DKPKP, spatial planning offices which are believed plays important role to strengthen community adaptation (Barton et al., 2015; Wijaya et al., 2017) failed to be involved.

d. Outcome

One of the goals of GIS application in public participation is legitimate the local spatial knowledge into an official data (Dunn, 2007), where the option of GIS technology to support the goal is paramount (Sieber, 2006). It is a concern that the effectiveness of GIS outputs should establish a causal relationship between the technology and the outcome of PGIS project (Sieber, 2006). Also, the benchmark for PGIS project such as PUNA should be matched with its goal and community local condition (McCall, 2003; Sieber, 2006). In a context of PUNA practice, the involved NGOs employed Web-based GIS. This technology yielded a sense of belonging to people that now they have their own spatial information through internet/website. However, to some extent, this technology also marginalises some of the community especially adults and elderly since the majority of those age groups in Marunda did not know how to access the internet. Although youths are encouraged to operate the provided GIS technology, it does not mean that proactive is necessarily the optimal level of usage (Sieber, 2006). If we highly concern about the longevity of applications, then there must be a need community to sustainably learn basic cartography (Ramasubramanian, 1995) and the vector representation of points, lines, and areas (Sieber, 2006).

Regarding the key elements of PUNA process, it is concluded that the PUNA process has empowered Marunda community to cope with hazards risks with their local context and capacities. It is seen that women in Marunda are now encouraged to take parts in issuing opinion and capable to manage their economies through certain activities. This process also generated ownership of people on the spatial information that they together with facilitators have produced. Typical GIS technology such as Web-based GIS simultaneously empowers and marginalises community in Marunda. This study suggests that youths not only apply and sustain the information but also disseminate the information within all community. Collaboration with government institutions in Jakarta needs to be expanded.

4.2. The extent to which the PUNA Outputs Satisfy the Communities and Local Government Needs

4.2.1. Community and Local Government Geo-Information Needs

The fieldwork was undertaken during September to October 2017, and a semi-structured interview was conducted with 45 community respondents, one chief of Marunda, and six local government institutions to obtain the geo-information needs of community and local government and their satisfaction towards PUNA outputs. The interviews were enriched by researcher observation as well as discussion with several NGOs members in the field. The researcher was also invited to join some meeting and workshop with the NGOs and local government pertaining community resilience agenda in Marunda in which also added the richness of data collection.

4.2.1.1. Community Needs

In order to probe the community's geo-information needs for measuring to what extent the PUNA outputs satisfy the community, questions in the semi-structured interview were set more indirect questions regarding the understanding of risk and vulnerability of community itself. Examples of questions;

- *What hazards types frequently occur in this area?*
- *What was the first thing you did after the last hazards occurred?*

Regarding 45 interviews within Marunda community, several community geo-information needs have been identified. Based on observation which is supported by demographic data of participants interviews, it is represented that the majority of people in Marunda are elderly and children. Most of the young adults tend to move to other places due to they have new families. Every week they visit their parents in Marunda. The elderly, as well as children, may have a higher degree of vulnerability in emergency situations among the vulnerable groups. Such information about vulnerability group in each neighbourhood in Marunda spatially will help community to map certain priorities to be resilient against hazards impacts.

Community deals with several types of hazards such as coastal flooding and cyclone. Coastal flooding as experienced in Marunda is not merely caused by higher than the average high tide but worsened by rainfall. The respondents, on the whole, indicated that they could not predict the occurrence of flooding directly anymore by only looking at the clouds or feeling the wind directions in particular day. At this point, there is no certain technology support them to predict the phenomenon, only based on their limited knowledge. One of interviewee explained, "*Formerly, we could see it from the dates, we could see it from clouds, now we cannot! For example, yesterday, the wind was so strong and heavy clouds. I predicted that the water sea would rise, but Alhamdulillah the water sea did not rise*". It is clear that community needs to be supported by weather forecast on coastal area information in order to be able to better prepare for the possible occurrence of hazards which exist in Marunda.

The limited knowledge of the community in predicting hazards occurrence through natural phenomenon can be supported by the provision of information about history occurrence of hazards in recent years. A significant number of participants could explain the hazards frequency even though the answers were varied. One respondent stated, "*The greatest event happened simultaneously with Tsunami in Aceh, 9 years ago. Coastal flooding is an annual event. One year there will be 2 times*". Another interviewee stated, "*Every 6 months the flooding occurs, but now it will be every 3 months*". Another participant also added, "*If the wind is strong meaning it is west wind and the flooding will come. West wind occurs on months 'ber' at the end. But, we cannot predict it anymore. For example, today is September, but until now, the flooding doesn't happen*". All responses indicated that understanding of hazards occurrence of the community should be supported with the availability of history occurrence of hazards over the years to help them better predict the possible hazards occurrence.

Similarly, Marunda community enabled to identify the magnitude of hazards occurrence even though only by approximation such as slightly above knee depth or up to ankle depth. They could explain which neighbourhood experienced flooding earlier than others as well as the duration estimation of the flooding. As such, based on the interview, the duration estimation of the flooding would be two hours to one week in the most extreme case, by which the majority of respondents said, the flooding would subside between three to five hours in normal case. One interviewee said, "*A little while, just two to three hours, five hours the longest*". These perceptions vary according to different ages and level of education (Chingombe, Pedzisai, Manatsa, Mukwada, & Taru, 2015). Therefore, information such flood extent area will enrich community knowledge in response to hazards impacts (Chingombe et al., 2015).

Then, as illustrated by Figure 16, Marunda community did not experience a bad drainage system until their houses were flooded. Most of the respondents claimed, "*it is a normal condition, so don't have to worry*". At this point, this condition would cause diseases and continue to disrupt the health status of the community as a whole. Surprisingly, one of respondent noticed this phenomenon as the result of densely housing development in Marunda. As he recalled his childhood, "*When I was child, before there were no many houses here, the flooding was only twice a year. Now it can be per 3 months or even per month. It is because there are too many houses and this area is adjacent to river, so water disposal [drainage] is very slow*". Regarding this phenomenon, Marunda community undertakes mutual cooperation (gotong-royong) every week to clean the wastes on conduits. However, they only clean what exists in front of their houses without knowing the conduits network. It indicates that information of conduits network could help people to minimise the hazard risks through waste management.

Figure 16. Conduits Channels Conditions in Marunda: (a) in neighbourhood 1, (b) neighbourhood 4, and (c) neighbourhood 9. Source: Direct Observation 2017

Furthermore, all respondents argued that there is no a stated-procedure for them to know where they will go for evacuating themselves as the flooding strikes them. They were also only supported by informal warning in which community start shouting each other to confirm that the water in fishponds and river exceed a perceived threshold, "*Yeah when flooding happened at night while all fell asleep, there was neighbour screaming flooding, then we just carried up things such as television, refrigerator, and couch to higher places*". Some of the interviewees said that they did not move to other places, "*We waited it. When we woke up, the flooding had just subsided*", while others said they moved to higher places randomly. Since there is no provision of emergency shelters, indicating community needs to have information of emergency shelters location and capacities.

4.2.1.2. Local Government Needs

Questions in semi-structured interview posed to government institutions were slightly direct questions which underlying the same topic. Government institutions were asked:

- *Does the planning in Jakarta consider the vulnerability of people when upgrading existing municipal infrastructure?*
- *What are information do you need to map risk and vulnerability related to hazards impacts?*

All respondents were aware of Marunda experiencing coastal flooding. In response to this phenomenon, Jakarta government currently develops a mega project called NCICD (National Capital Integrated Coastal Development) in which they will establish integrated polder system in Marunda particularly. However, it seems quite ambitious for helping the community in response to hazards impacts for the short-term plan. In addition, they were also alert that Marunda has a soil type that cannot absorb water, and then they need to know the existing drainage condition in order to reduce the inundation of flooding. As one of the government institutions said, "*Due to the soil cannot absorb water, then the inundation will rise quickly. Also due to the polder system has not established yet which seems to be prone. As for now, we just try to make a reservoir. It is 40% of the progress. So, information such as drainage system will help to develop the system*".

Regarding response to flooding occurrence, information for the existing of land use and public service distribution may help the government to make a mitigation plan such as determining the emergency locations. In this case, the respondents concerned on open space which can be used as the assembly points or emergency points. As one of the government institutions stated, "*[…] It is because we need to know whether that open space can be used as assembly point or not*". Further, the respondents mentioned that the need on information of the existing public services distribution which can be combined with the existing land use might support the development of emergency shelters. One of the government institutions said, "*[…] information about access to services. How many and how easy community can access the basic services such as market, health care, etc.*".

Concerning the socio-economic aspect by which local government considered it as predominant information that can help identify the degree of vulnerable groups, including education, age, income level, family size as well as population density. As one of the government institutions emphasised, "*Community's vulnerability to hazards impacts will be higher if the socio-economic condition is low, vice versa*". Also other respondent added, "*For hazards risk, more related to population density. We need to have the population density data in order to know whether enough or not one area accommodates the existing total population*". Regarding the need of socio-economic information, one of the respondents admitted that the availability of information about socio-economic is limited. As one of the government institutions revealed, "*We only have data from 10 years ago which is not quite relevant if we use it*". It indicates that they considerably rely on community to corporate in providing the information.

Regarding the hazards impact itself, government institutions considered preparedness-measures during hazards occurrence. They emphasised the option of the best routes for evacuating as they were aware that Marunda is a densely housing area, difficult to evacuate people from door-to-door. As one of the respondents explained, "*At the time of the event, the shortest way is to go through the yard for example, since the streets [alleys] are not efficient. Then we need to have a clear sign for evacuation. But this is not enough if we simply make socialisation about it, because for slums in Jakarta, the dwellers always moved out and changed*". It is clear that determination for evacuation routes will help the government to evacuate the community quickly.

4.2.2. Satisfaction of PUNA Outputs

In the fieldwork, participatory mapping and photovoice methods have been conducted to derive data related to the satisfaction of community and local government towards PUNA outputs. Participatory mapping was conducted with 45 respondents of Marunda community in a semi-structured interview and six key informants in focus group discussion, while photovoice was conducted with six key informants in focus group discussion and six respondents of government institutions in a semi-structured interview. The aim of using two methods in this research is to yield reliable subjective data regarding the perception of community and local government associated with PUNA outputs. Examination of PUNA outputs focuses on information of preparedness-measures maps that consist of neighbourhoods boundaries, flooding extents, evacuation routes, and emergency shelters. In addition, other capacity building activities that Marunda community conducted and regularly reported in MURIA web-based map.

4.2.2.1. Community Satisfaction

The participants of participatory mapping in the semi-structured interview were asked to draw information related to hazard identification and emergency management which guided by researcher protocols. Whilst, in FGD, the research protocols were more detail concerning the participants were key informants, including hazard identification, vulnerability, emergency management, and capacity building activities. In this case, the participants in FGD were stimulated by drawing the information by participatory mapping method, then later they were represented the PUNA outputs by photovoice method to identify information within the PUNA outputs. The mix-used method of participatory mapping and photovoice in FGD particularly could produce unbiased perception on PUNA outputs.

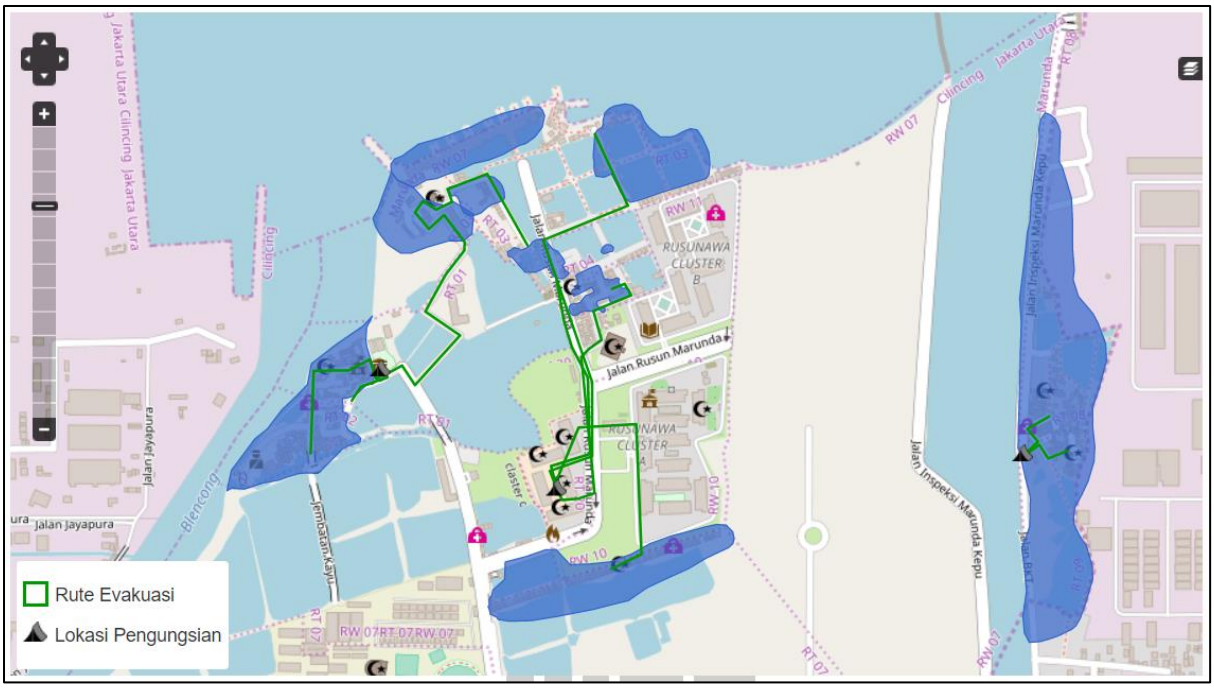

Figure 17. Preparedness Map of PUNA outputs. Source: https://openstreetmap.id/marunda/

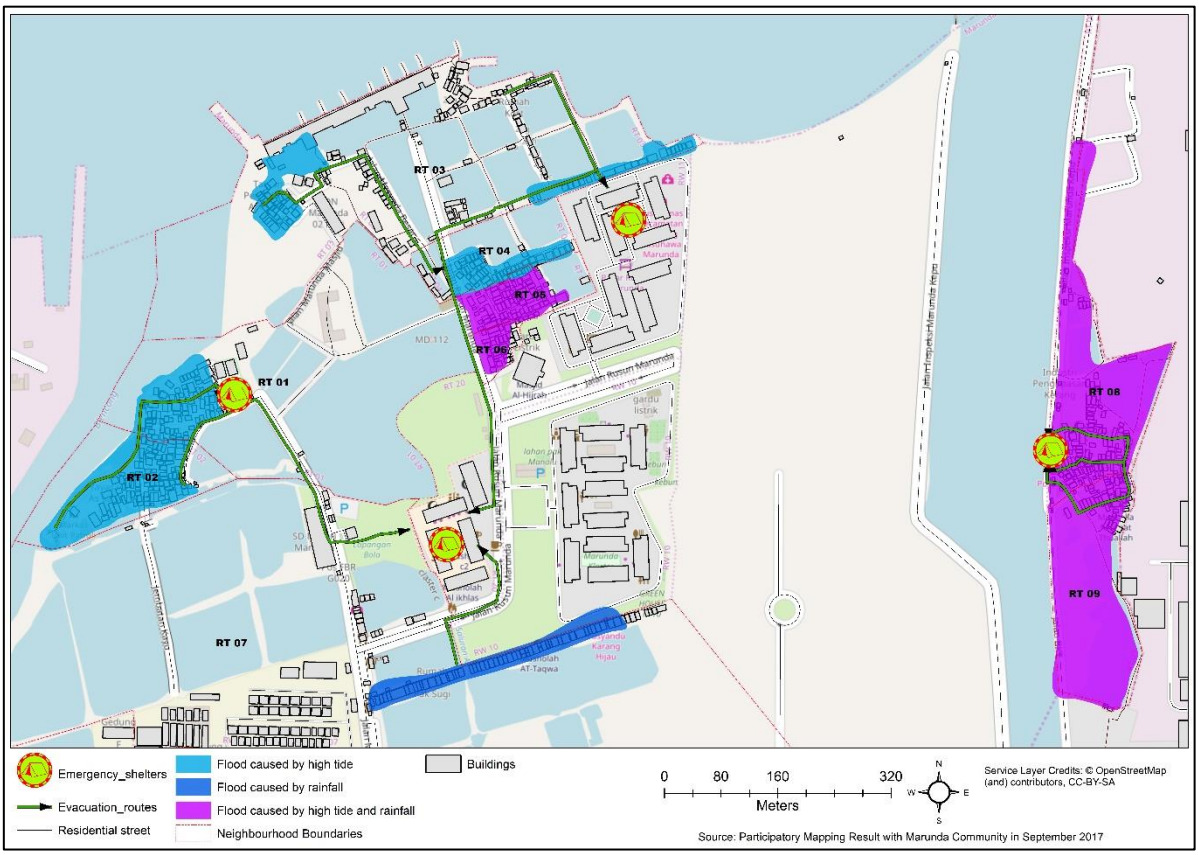

Figure 18. Result of Participatory Mapping in Semi-Structured Interview and FGD with Marunda Community. Source: Fieldwork in September 2017

After triangulating information from a semi-structured interview with community and FGD with key informants as shown by Figure 18, the results show that there are several neighbourhoods experience flooding only by higher than average high tide and or by rainfall. Compared to PUNA outputs (see Figure 17) for flooding extent in particular, it showed only the flooding exposure, yet not informing the cause of the flooding. In FGD through photovoice, the participants noticed that information in PUNA outputs should separate the flooding extent based on the causes. As one of the participants in FGD through photovoice commented, "*This is mixed, not only because of high tide, flooding caused by rainfall also. So, there are 3 neighbourhoods that were affected by flooding with those two causes such as neighbourhood 8 and 9*".

Further, the participants were satisfied with the representation of flooding extent, the location of emergency shelters, and neighbourhood boundaries. They could recognise the flooding by understanding the transparent blue colour above the base layer of the map which represents the flooding. The participants could also identify neighbourhood boundaries by recognising some specific places. In addition, the representation of emergency shelters by icons also help participants understand the information as well as the locations. However, one of the participants felt that although she personally could understand information in the map, other people in Marunda community will encounter difficulty while reading the PUNA outputs. As she said, "*I could read these, but I do not know for other people*". This quote draws attention to the fact that understanding in reading some information through maps in Marunda community is relatively low.

On the other hand, as shown in Figure 17 the participants encountered confusion in identifying evacuation routes. There are many lines overlapped, and there is no signpost which could lead readers to understand the provided information. As one of the participants commented, "*It is too small. Maybe we need to zoom in it. We also feel confused, overlapped!*". Another participant added, "*I like it, but it is not too detailed. It is not perfect yet*".

It indicates dissatisfaction on the representation of evacuation routes. Hence, additional line arrows and reduction of lines would help community easy to absorb the information.

4.2.2.2. Local Government Satisfaction

Based on photovoice method in a semi-structured interview with government institutions, the findings reveal that government are satisfied with the information on PUNA output as it is community-based information. However, there is an input that may be considered, is that government suggested utilising the land-use plan map as a base layer in order to clearly define the particular land-use for particular demand of community such as plots of emergency shelter locations. Indirectly, the government also need community to understand the land-use plan. As one of the respondents explained while she observed PUNA outputs, "*It probably needs to be overlaid with land-use plan, also in order to community know it. For instance, let's say what community plot in here for emergency shelter is currently empty land. When the plot has implemented, but the fact that there should be particular development there in future. It means that emergency shelter is not for long-term*".

Apart from the suggestion, the government enormously concern on the coordination of information as well as the source of information. For instance, information about evacuation routes is acceptable. However, government need to validate the information through direct observation as evacuation routes that should always be in clear condition (without any hindrance), and it will not be affected by other development. As one of the respondents considered, "*If these [points for emergency shelters in PUNA maps] are decided to be evacuation shelters, we should check there whether those areas are ideal for evacuation shelters. If not, then we need to supply other facilities […] but, the most important is that community knows better about the locations. At least they know how to reach the locations and how safe the locations are. We as government are just to controlling, monitoring, maintaining if there is something not suitable then we need to relocate it*".

On the other hand, concerning the dissemination of information, government institutions considerably emphasised on the trust in information. In this case, they are concerned on the mechanism in obtaining data and who is responsible for approving the reports through to dissemination. One of the respondents argued, "*We just want to avoid inaccurate information. Maybe the Chief can approve the data before. It is because if we take the information from OpenStreetMap just like that without knowing if it is valid or not, that would be dangerous*".

4.2.3. Discussion

There are several inputs or information needed that can be provided to improve the usability of PUNA outputs. Based on geo-information needs analysis, community acquires information that could help them better prepare to the hazards occurrence such as weather forecast and historical of hazards occurrence. On the other hand, reflecting on local government needs, the PUNA outputs should utilise the land use plan map from Jakarta spatial planning as a base layer in PUNA maps, as government argued that this information could support them to take actions for implementing place-based policy. Information of the existing conduits networks is necessitated for both stakeholders. Furthermore, information on vulnerability groups, flooding exposure, emergency shelters, and evacuation routes have been available, yet need to be improved in associated with information and representation. For example, information about education level in which can be added in vulnerability groups information.

The findings upon the geo-information that community need are actually only relevant with their local realities and priorities. The community is generally aware of how some risks have changed over time. Provision of information such as weather forecast, historical hazards occurrence, the existing conduits network, etc. (as mentioned in the previous paragraph) could help community to not only respond to the past events, but prepare what may be coming (van Aalst, Cannon, & Burton, 2008). For example, geo-information of historical hazards occurrence can help community to better predict the possible hazards occurrence, to reduce their vulnerability (Prater & Lindell, 2000). However, since they only need to have

information related to their local realities, then they should also need external technical support to help them set certain priorities in addressing the risks (Measham et al., 2011). Therefore, stakeholders including government and NGOs can support them to collectively bring the ideas and actions to produce solutions.

On the other hand, geo-information that government institutions need to respond to hazards risks in Marunda fundamentally are essential information such as the existing infrastructure, the existing socio-economic condition, and hazards identification. They emphasised upon information which can be used for a mitigation plan. These kind of information are quite specific and can be addressed by the involvement of community as local knowledge owner and grassroots organisations. With respect to both sides of geo-information needs which are complemented each one and another, it is concluded that collaboration amongst stakeholders ideally will fulfil the needs of both sides for addressing hazards risks in Marunda.

Furthermore, regarding satisfaction towards PUNA outputs, the majority perceptions of participants within Marunda are satisfied. It is clear that they never have such information of spatial representation using web-based map. It is observed that they compared themselves with other hamlets and sub-districts within Jakarta that currently, Marunda is the only urban village which has such online information spatially. Then, it inevitably generates ownership of people on PUNA outputs. However, they still felt that there is some information that should be updated and fixed in order to provide understandable information to the whole community in Marunda.

Conversely, the government are satisfied and understandably reluctant at the same time to the PUNA outputs. It might because of government lack trust to the community. They essentially emphasised on the suitability between demands and provisions, coordination of information and the trust and credibility of information. These findings prove that there is still lack of collaboration with government institutions in PUNA process in which need to be expanded to provide enabling environment for the integration process. The involvement of government institutions in entire stages of the process is paramount (Cloutier et al., 2014). However, there are some issues that obscure enabling environment for PUNA outputs to be integrated into spatial planning in Jakarta which need to be investigated. Thus, it would analyse and discuss in the following section.

4.3. What Constitutes an Enabling Environment through which PUNA Outputs can be Integrated to Jakarta Spatial Planning from Collaborative Governance Perspective

4.3.1. Barriers Influencing integration of PUNA Outputs into Jakarta Spatial Planning

Questions within the semi-structured interviews focused upon four components of capacity for joint action dimension of collaborative governance framework which are institutional arrangements, leadership, knowledge, and resources. The questions aim to reveal the barriers which may influence integration process for community-based planning into formal spatial planning in Jakarta that falls within the four components. Questions were posed to government institutions and Chief of community. The questions were asked:

Institutional Arrangement

Government institutions were asked such as;

- *Does your institution collaborate with other institutions to address hazards impact in the community?*
- *What are the challenges you face in institutions collaboration?*

Chief was asked such as;

- *What is your role in relaying information from community to government*
- *What do you think about the relationship between government and community?*

Leadership

Government institutions were asked;

- *Does the municipal spatial planning explain the support and involvement of emergency management?*
- *Did the preparation of the municipal spatial planning involve a broad base of the community such as civil society and citizen ?*

Chief was asked:

- *Does local government provide a space (opportunities) for community to participate in the decision-making process?*

Knowledge

Government institutions were asked:

- *Does spatial planning consider the hazards impacts when upgrading existing municipal infrastructure?*
- *Does spatial planning consider the vulnerability of people when upgrading existing municipal infrastructure?*

Chief was asked:

- *What is the main role of community in the decision-making process?*

Resources

Government institutions were asked:

- *Is there budget allocation for support and involvement of community in the decision-making process?*

	Behaviour	Institutional...	Knowledge	Leadership	Resources	Technology	Totals
Institution 1	0	1	2	3	1	0	7
Institution 3	0	2	0	1	0	0	3
Institution 2	0	1	0	1	0	1	3
Institution 6	0	0	2	2	0	0	4
Institution 5 cont'd	0	1	0	0	0	0	1
Institution 5	4	0	2	2	0	0	8
Institution 4	2	4	0	2	3	0	11
Institution 4 cont'd	0	1	0	1	0	0	2
Insitution 1 cont'd	0	0	0	1	0	0	1
Chief	2	0	1	2	0	0	5
Totals	8	10	7	15	4	1	45

Figure 19. Cross Tabulation of Coding Analysis of Government Institutions Transcripts

The transcripts from the semi-structured interview with six government institutions and chief have been analysed by QDAS software (Atlas.ti version 8.0). The transcripts have been coded based on predefined codes which are related to the four components of capacity for joint action dimension of the collaborative governance framework. The researcher focused on seeking expression of interviewees which can reveal the barriers. Thus, as figure 19 shows the frequent number of code quotations within all transcripts of government institutions and chief. The figure illustrates that leadership component is the highest number of codes with 15 quotations, followed by institutional arrangement and behaviour with 10 and 8 quotations respectively, and knowledge, resources as well as technology with 7, 4, and 1 number of quotations respectively. Hence, this result represents that barriers which may influence the integration of community-based adaptation planning into Jakarta spatial planning considerably lie in the lack of leadership. This result will be further described in this section.

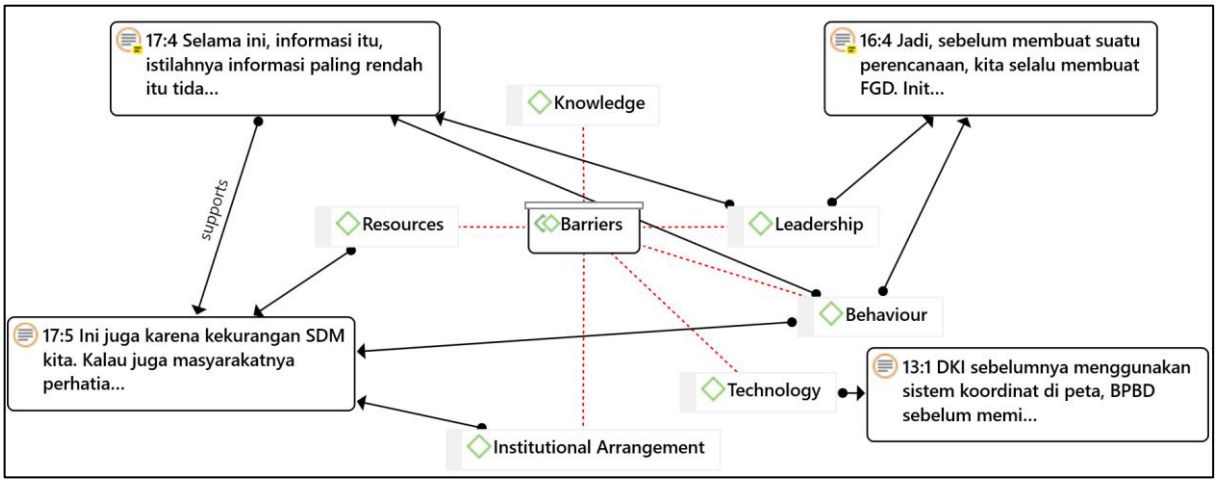

Figure 20. Semantic Network of Coding in Atlas.ti.

Before exploring the findings, it is needed to be explained that when analysed specifically about the four components, two key components were raised; behaviour and technology. These two components emerged as respondents specifically respond to the researcher's questions, probing that within four components, there are other two components should be highly taken into account. As figure 20 illustrates that behaviour component relates to quotations which also raises from all four predefined components. It is analysed that interviewee's responses also have relation with behaviour component which effects the four component, which means that this component is crucial. Whilst, technology component is emphasised by one respondent as one of the barriers which influence the integration of community-based adaptation planning into official spatial planning in Jakarta particularly. Therefore, behaviour and technology components were added to specifically describing the barriers as well as enriching the understanding in a thematic manner.

a. Institutional Arrangement

The interviews revealed that there is an overlapped responsibility amongst relevant government institutions which may hinder the mainstream of community-based planning into spatial planning. It is evident from respondents arguments that between institutions internally encountered difficulties in the division of tasks and functions which are then not carried out properly. Here is an example of one interviewee explained:

> "*[…] for example, we need to have highway data which intend to be implemented, it is in Bina Marga Office. However, they also do not have targets in which roads of Jakarta want to be implemented. In our office, we have responsibility only for making the planning, but when it is implemented, it is another office's responsibility*".

The argument above indicates there is a gap in tasks and functions as well as 'silo mentality' within government institutions which compound the integration initiatives. It may result in dilemma on coordination and communication between community and government entities to integrate community's initiative through community-based planning. One of the government institutions explained:

> "*Disaster management cannot be done partially. Why not? It is because one disaster issue is strongly related to task and function of all government entities or relevant institutions, and closely related to society itself. Therefore, we need to raise awareness of society, business sector, NGOs, and us as government. What awareness? Awareness for the sense of belonging and willingness to participate in managing the community*".

> Similarly, one of the respondents also added, "*[…] if we talk about resilience, we talk about integration. It has not been developed yet. Thus, why there is another planning from BPBD is maybe there is another planning for*

mitigating disaster in Jakarta. If disasters in BPBD is more to the preparedness-measures, also responses, but lack of synchronising with spatial planning. The fact that it is better if spatial planning has it all".

It is clearly defined that the coordination between stakeholders in Jakarta has not been well established yet (Sunarharum, 2016). Additionally, the policy framework wherein local government operates is considerably determined by the higher level of governance, including regional, provincial and national policies. As such, it leads to the lack of local authority to make decision for their local administrative. The lack of local authority including local planning authority will affect a conducive integration process for community-based planning to Jakarta spatial planning. As one respondent stated:

"*In Jakarta, we have regional autonomy in which all final decision is in provincial level. Even for its region, such as North Jakarta, South Jakarta, East Jakarta, etc are administrative only, not for making policy or taking a final decision. That is all in the province. We know our territory, we know the conditions, but ultimately banged there*".

Although the government in city-level acknowledge better the demands of people within the city, however, the final decision is still in a higher level. The constraint is doubled by government lack of coordination, including an unclear responsibility amongst all government institutions, so that adaptation planning by which community has planned may find problematic to be integrated into official spatial planning since community did not know to whom they should coordinate.

b. Leadership

All respondents acknowledged that Marunda has high risk to coastal flooding. However it does not make most of the government institutions commit to help people cope and adapt to the hazards risks. One of the respondents argued that in implementing some of place-based policy, there are certain issues that should be prioritised. Yet, Marunda condition does not make a big impact on their priorities. As one of the government institutions stated:

"*We want to fulfil their demands, but we have priority scales. It is impossible to give priority in area of Marunda, for example because of congestion, then the roads are widened. Whilst, Yos Sudarso road which is the main road is not cared for. So that, the budget does not meet the demands of Marunda*".

This quote represents that there are certain priorities competing within relevant government institutions. Additionally, it is clear that they set their priorities based on the function and the benefit of higher scales. Instead, the local scale seems to be the last priorities. As such, it shows a strong top-down development in Jakarta fundamentally which can hinder integration process for community to mainstream their initiatives to the higher level.

Further, although there is a bottom-up approach, named Musrenbang[5] which annually organised by the local government. It seems counterproductive to empower people to involve in the decision-making process, instead, reflecting government decide the development unilaterally. As Chief of Marunda stated:

"*Last Musrenbang in 2016, there were no any provisions come for us. We had proposed many inputs related to environmental improvement, such as bridges, low-covered alleys which should be raised, but in 2016 nothing! the budget in 2016 did not come to us*".

[5] Musrenbang is an annual consultative forum conducted participatively by stakeholders to draw up regional and national development (Idajati et al., 2016).

The respondent also added, "*Talk about process, there is a unilateral decision, there is a compromise. For example, this vertical social housing, local government are the one who decides, we just follow their program. It is supposed to involve us as chiefs and key informants*".

The quotes draw attention to the fact that there is still a gap in policy-making process in which local government are expected to play the important role to relay information from community to the higher level, and vice versa. Furthermore, this can be seen in the current spatial planning in Jakarta that there is still no adaptation planning embedded in the spatial planning. This finding strongly relates to knowledge component within community and government. As one of the respondents explained:

"*I studied RPJMD [Regional Medium-Term Development Plan] 2030 in Jakarta, there is no explicit telling about disaster and resilience. But actually, there is in somewhere such as open space, integrated friendly kids public space, etc. Each government institutions have different perception about resilience […] whilst if we talk about resilience, we talk about integration. It has not been developed yet […]* ".

c. Knowledge

Expanding the analysis from the prior section that there is still no adaptation planning embedded in the current planning, it might because government acknowledge phenomenon that happens in Marunda only from a general perspective. They are aware of the hazards risks, environmental condition, and socio-economic status in Marunda. As two of participants explained:

"*Marunda is located in North Jakarta, which is one of the potential areas of coastal disaster because there is a lower land area than the sea. There are many industries and warehouses*".

"*Jakarta actually is about flooding and fire. If for earthquake and tsunami are relatively low potential. Therefore, Jakarta is highly potential to flooding and fire*".

However, the quotes reveal the fact that government institutions acknowledge the Marunda condition based on what exists on the shelf. Instead, they do not know the actual or the specific problems in particular area such as the degree of community vulnerability and how the community can cope to the hazards risks. It is proved by interviewee itself that she had never received any information specifically about Marunda condition. As she revealed:

"*As such information [problems] has never reached us. If there is such information, they should report.* […] *In Musrenbang, they just complain, complain, complain, 'this is broken, this is flooding, please fix the conduits'. But, they don't tell us in detail information. […]*".

In addition, they lack understanding of how much community has local knowledge related to hazards risks and climate change that can be incorporated to have a robust mitigation plan as they want to possess. As one of the participants perceived:

"*People do not know if a development needs a sacrifice. Their mindsets are still not 'click'*".

This quote reveals the perception of government to the community that the government perceived community lack knowledge and understanding on urban development, so that community's knowledge is reluctantly considered in the decision-making process. It is strongly related to behavioural of government institutions that will reveal in next section.

d. Resources

The interviews revealed that there are no budget issues hindering the integration for community initiates their planning into spatial planning. However, it is about human resources that government institutions need to have in order to accommodate an enormous number of population in Jakarta. As one of the government institutions stated:

> "*It is also because of our human resources. If community cares about their living environment, they will give us detail information. As of now, I just can plot information in the map, but the information resource is just from reports. But then, it backs again to the tasks and functions that I have, too much. That is why this task cannot be handled until finish*".

> Another perception from another respondent, "*One of Jakarta weaknesses is that it has a huge number of people if we compare with other cities in the world. So, to chase the population growth for standard facilities provisions must be difficult, as same as to involve community. We need more people. That is why lack of approach to community*".

The quotes indicate that government institutions in Jakarta lack human resources which also has been linked to lack of institutional arrangement which is the division of task and function within government entities. Further, it will yield less attention to community in which inhibit effective integration for community-based adaptation planning.

e. Behaviour

The interviews unfolded that behaviour is also one of the barriers which may influence the integration process. With respect to knowledge component, most of the respondents have misconception of community that they do not have abilities to produce knowledge which ideally can be integrated into spatial planning. As one of the respondents stated:

> "*If we can compare from Netherlands, Singapore, England etc., their communities are very concerned about their cities. Second, they are willing to give positive inputs. Third, they have knowledge. Different with our community, especially Marunda, 'pity'. So, we have Musrenbang which is organised annually. Then, it backs again to society. Ideally, in Musrenbang they give important inputs, but the fact, they just think like, 'Sir, our streets are damaged', 'Sir, we need hospital' which is only physical. So for future planning has nothing yet, as they have no knowledge of urban planning*".

Then, it is compounded by the behave of community that government perceived as a mismatch with their effort to involve people in decision-making process. As one of the government institutions argued:

> "*Before making a plan, we always make FGD, […] the problem is that we invite the homeowners, at least the husband or the wife, but the fact that in Jakarta the one who comes is not the homeowners, instead, a housemaid or a driver or a babysitter. So, the information does not reach to the homeowners. Therefore, we tried to organise the FGD in the weekend, so that there is no excuse anymore about busy things. But still, people do not want to come*".

The quote represents that it may be as a reason of why government reluctant to involve community in decision-making processes. It shows that government feel saturated with community's unawareness attitudes of how fundamental their participation in the process, resulting government takes a unilateral decision with the power that they have as decision-makers. In addition, in respect to community itself, they tend to follow the higher level to manage them without consensus. As one respondent spoke up:

> "*Yeah, we are just bottom level, we just follow the higher level*".

As such, it also may be as the result of top-down development regime which yields people lack opportunities to raise their voices. Then, it may affect community to empower themselves in mainstreaming their adaptation planning into spatial planning in Jakarta.

f. Technology

Based on the interviews, there is one respondent considered technology issue while integrating the community-based adaptation planning into spatial planning. The respondent argued in light of projection differences, it will take times to make it integrated.

> "*Projection which used in Jakarta is still local T32, whilst BPBD with their Google Earth use UTM. Now, we are trying slowly change our coordinate projection. Also we are still trying to develop new maps. I think it is also about coordinate projection*".

This quote proves one example of a gap in technical issues amongst government institutions. The integrated data and information still become a major problem which inhibits knowledge sharing and collaboration within all stakeholders in Jakarta.

4.3.2. Discussion

The five barriers recognised in adaptation literature, i.e. lack of institutional arrangement, leadership, knowledge, resources, as well as behaviour were clearly evident in the case study Jakarta. While lack of technology was also found in this study. In terms of institutional arrangements, the findings reveal that there are two limitations which can hamper the integration of community-based adaptation planning into spatial planning in Jakarta, including limitation of coordination between local and the higher level and limitation of distinct responsibilities amongst government institutions. This finding is similar to other adaptation literatures (Barton et al., 2015; Measham et al., 2011; Sherman & Ford, 2014; Wijaya, 2015; Wijaya et al., 2017). Concerning these issues, stakeholders' view on community-based adaptation initiatives potentially harm government priorities and interests which are closely related to limited awareness and participation, behavioural and lifestyle people, and lack of leadership (Wijaya, 2015).

The top-down character is still hugely embedded in the spatial planning process in all cities in Indonesia, including Jakarta (Firman, 2004). It is believed that adaptation issues are local context (Cloutier et al., 2014; Measham et al., 2011) and cross-boundary issues within multiple levels of stakeholders (Barton et al., 2015). Then this is a challenging for community to mainstream their initiatives since there is inter-institutional matters that still deeply embedded amongst government institutions. The silo mentality leads to frustration of institutional government entities as well as community, further, hinders collaboration. These findings emphasise that local government play an important role in mainstreaming adaptation (Cloutier et al., 2014).

The issues in institutional arrangements are strongly related to the lack of leadership amongst government institutions in Jakarta (Measham et al., 2011; Wijaya, 2015; Wijaya et al., 2017). Coordination amongst different level of government has been challenging since they perceived less meaningful of community engagement in decision-making processes. According to Amundsen, Berglund, & Westskogh (2010), a lack of attention to climate change at the higher level leads to a lack of attention to climate change at the local level. In the case Jakarta, this issue is acute in regards to certain priorities of higher level towards spatial planning. It is as same as Measham et al. (2011) found in their case study. Preston, Westaway, & Yuen (2011) argued it is an example of lack of political will. Interviews with different level of government institutions make it clear that they assume all areas in Jakarta have same issues such as flooding. Thus it is considerably constraining any attempt to incorporate community-based adaptation into spatial planning which we believe that different areas/arenas have different approaches to derive solutions.

In general perspective, coastal flooding that happens in Marunda is seen as common flooding by Jakarta government. It leads to government less attention to the community initiatives. It is worsen by government lack trust to community in which they perceived that community is unusable to the decision-making processes. Based on observation, Marunda community has substantially local knowledge that can be utilised as inputs of such development planning and validation of such any development interventions (Adger et al., 2009; Yuen, Jovicich, & Preston, 2013). Moreover, lack of awareness of community itself complicates the issue of collaboration within stakeholders. It will be highly acute if both parties do not possess a willingness to sustain a city. Although there is a bottom-up process in Jakarta to accommodate community initiatives for the decision-making, it seems useless as the distrust and the unawareness still embed in government and community respectively.

Based on interviews regarding resources component, it was clear that local government need professional assistance or outsourcing support in identifying communities specific vulnerabilities in particular areas. This issue is similar to those in either developed and developing countries or cities as exemplified in case of Australia (Measham et al., 2011), The New Jersey (Lathrop, Auermuller, Trimble, & Bognar, 2014), and South Africa (Pasquini, Ziervogel, Cowling, & Shearing, 2015). Local government in Jakarta expressed the need for mapping expertise, especially in the light of limited staff, which hindered their capability to undertake geospatial information.

The availability of geographic data that Marunda community has produced is such a stepping-stone to be able community to raise their initiatives to decision-making processes. Also, it can help government to have spatial information as discussed earlier. However, in this study found there is technology barrier in which different government institutions use different map projection. It might largely make it slow the process of integration, worsening the issue of trust and credibility of data. There is a need to expand the collaboration to relevant government institutions to take parts in the process of obtaining information. However, there are institutional arrangements, leadership, knowledge, behaviour, and resources issues within stakeholders that hugely affect the collaboration initiatives.

4.4. Reflection; PGIS and Collaborative Governance

This section describes the relation between public participation in Marunda (PUNA) which relates to collaborative governance perspective to find enabling environment of community-based adaptation integration process. As demonstrated in Figure 21, regarding place and people that emphasises on cultures, government institutions still embed silo mentality amongst them. In associated with the geographic location of Marunda that has issues on land tenure, it might affects government less to take into priorities Marunda community. In addition, complex characteristics of people in Marunda (which influence the tolerance of expert solution) also might affect it double for government to put their priorities to Marunda community. It is necessitated to have adaptation leadership to the officials for driving adaptation issues as one of their priorities, although this issue is nascent (Archer et al., 2014). A number of literatures have drawn attention to the importance of individual politicians or institutions to mainstream community-based adaptation (Carmin et al., 2012; Measham et al., 2011; Pasquini et al., 2015).

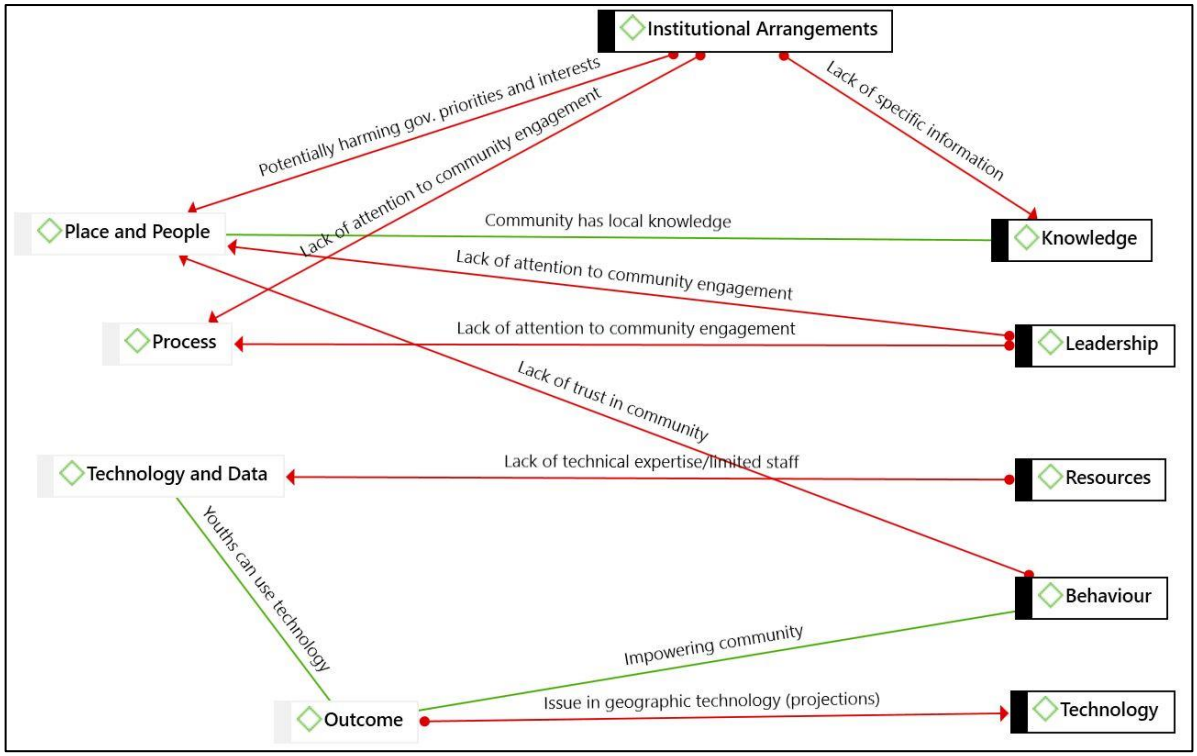

Figure 21. Mapping the barriers using PGIS framework themes and Collaborative Governance Framework Components.

The PUNA process that has been conducted in Marunda performed well in engaging community to build a resilient through optimising their capabilities towards their local context as it is project's goal. The participatory process has tried to promote a multi-stakeholder approach to engage more relevant local NGOs and government institutions. Focus on government involvement, it is reported that there were two government institutions committed to join the agenda in building community resilience in Marunda. However, community and the facilitating NGOs were not successfully involving spatial planning institutions in provincial even in the local level. Based on the findings, it should be considered some issues that frustrate the collaboration that is illustrated in Figure 21. Therefore, efforts to reshape policies and regulations are emerging.

As Cloutier et al. (2014) argue, lack of human resources, information/data, and leadership can be avoided through a participatory process that supports the information sharing, knowledge, and experiences of urban environment, hazards events, and the lesson learned from previous feedback. The PUNA process has produced data in web-based GIS in which government can use as inputs in the decision-making process. There are some issues such as only youths can operate the technology, government lack technical expertise, and government highlight on the trust and credibility of data. Thus, those issues can be turned into opportunities for government and community as well as NGOs and academicians to increase collaboration in order to produce and disseminate reliable and credible information. As Wijaya et al. (2017) stated that data availability, quality and accessibility remain challenging for integrating adaptation information into spatial planning in all cities in Indonesia including Jakarta. The availability of community-based data as well as collaboration with NGOs and academicians can significantly help local government to minimise the issue in local level and also reinforce technical expertise in Jakarta.

It is concluded that the public participation in making community adaptation planning in Marunda trough PUNA reviewed well in empowering community to understand the importance of participation and of their knowledge for urban development, especially in climate change adaptation. The weakness of a whole

community's ability to use, maintain, and sustain the technology will be maximised by multi-stakeholders collaboration, and vice versa. Then, integrating this community-based adaptation planning into spatial planning is critical. Therefore, to provide enabling environment for the integration, the findings concern significantly on lack of institutional arrangement, lack of leadership, lack of behaviour (e.g. misconception of government on community's knowledge), and lack of technology (e.g. different map projection).

4.5. Enabling Environment for Integrating PUNA Outputs into Spatial Planning in Jakarta

The endeavour of community and NGOs to produce community-based adaptation planning can cut out the limited data and information as well as generate community awareness on participation. However, the findings highlight a number of factors critical to enable community-based adaptation planning integrating into spatial planning.

First of all, there is a need for institutional reform to put community-based adaptation on the agenda. The findings show, by identifying the limitation of institutional arrangement, it is possible for local government to argue a basis for reform at the higher level in order to provide authority to plan in climate change responses from community base. If urban resilience is to enter the concern at the local level, then the capacity of people and institutions to understand the climate change and hazards risks and how to adapt to them needs to be strengthened by giving authority to manage and plan for the administrative boundaries (Measham et al., 2011). An example of the case Australia by which government New South Wales are lobbied to change the laws in regard to enable local government to operate and to plan for the climate change impacts (Measham et al., 2011). Moreover, this effort is strengthened by Firman (2004) and Wijaya et al. (2017) who argued, major issues in Indonesia is that the role of government in spatial development needs to change at all levels and the capacity of local government in spatial management needs to be reinforced. Therefore, this effort will provide opportunities for raising awareness of local capabilities in overcoming climatic uncertainty as well as for reshaping socio-technical institutional relations (Archer et al., 2014).

The second is to ensure top-down priorities are aligned with local-level needs. It is known that top-down character is still embedded in spatial development planning in Jakarta. Then it is critically argued that a coherent top-down policy framework is essential in ensuring the integration of community-based adaptation into spatial planning in order to avoid mismatched priorities amongst different levels of government (Archer et al., 2014). It is also that suggested by Cloutier et al. (2014), Mardiah et al. (2017), Measham et al. (2011), and Pettengell (2010) in providing an enabling environment for community-based adaptation. By mainstreaming the adaptation from the bottom-up process, it will strengthen the adaptation effort of the higher level. As Measham et al. (2011) emphasised, opportunities and constraints associated with local government adaptation efforts reflect a range of challenges with respect to how cities structure their higher level adaptation efforts.

An effective adaptation action can be developed and embedded in spatial planning if the local government has will and leadership to execute the tasks and actions towards climate resilience (Archer et al., 2014; Barton et al., 2015). The awareness of government of Jakarta toward urban resilience currently emerges that is seen through the initiation in building Jakarta resilience framework. They have been collaborating with international NGOs to establish Jakarta resilience strategies with three stages of development, including the establishment of resilience platform, preliminary resilient assessment (PRA) and framing the strategies, and to strategies implementation. This action provides potential and opportunity to integrate community adaptation planning. From a bottom-up perspective, PUNA process emphasised multi-stakeholders collaboration to strengthen community to the climate change and hazards risks. Then, it is hoped that both sides can find the way in which certain concerns and goals can be integrated. As many pieces of adaptation literature argue the multi-stakeholders approach undoubtedly can generate effective climate adaptation

governance (Archer et al., 2014; Mardiah et al., 2017; Measham et al., 2011; Pasquini et al., 2015; Wijaya et al., 2017).

About the opportunities, it is considerably determined by leadership. Leadership is the third key factor, and this study suggests that while political leadership is important for driving swift change, local leadership can be essential for aggressive change (Measham et al., 2011; Pasquini et al., 2015). The hazards risks, climate change, and their costs provide substantial initial catalyst for local government to transform their development towards more sustainable. This transformation is assisted by the acknowledgement that the environment, the community and the local wisdom have value (Pasquini et al., 2015). As such, leadership factor is highly needed within local government to achieve successful adaptation action. It is essential to emphasise that the development of the leadership can be addressed through a participatory process (Cloutier et al., 2014).

With respect to leadership and public participation, the findings encourage local government to trust community, regarding their abilities in providing data/information, incorporating their knowledge and cultures to achieve effective adaptation planning, despite the power relations is complicated to be addressed. Although there is a bottom-up process in decision-making in Indonesia, it seems failed to obtain community initiatives. It has been proved by researchers from Conoras (2007) and Bitongo (2013) that the identifying needs of community in Musrenbang remain questionable. It is undoubtedly argued that "local communities can generate clear and practical information and disseminate it, opening different options to enable more effective actions in cities. Involvement by communities which have been affected by climate impacts can drive action by decisionmakers, […] and reluctance by politicians to share information about probable risk areas" (Archer et al., 2014, p. 350). Hence, apart from building awareness of participation in community for urban development, local government also needs to have capacity building to understand how importance adaptation issues related urban planning and management and make it as one of the priorities in Jakarta development.

The last critical factor is to encourage government of Jakarta to focus on integrated geospatial data. It has been a challenge in Indonesia to have one map policy to reduce overlapping maps related to land resources issues (Wibowo & Giessen, 2015), reflecting in the case of this research. It is an essential issue that affects political issues such as conflict of interest of the different institutions involved (Wibowo & Giessen, 2015). However, this issue is highly important in regards to an effective adaptation planning in spatial planning (Mardiah et al., 2017). There are needs local government to incorporate with Geospatial Information Agency (BIG) and BPBD associated with integrated data and information (Mardiah et al., 2017).

5. CONCLUSION AND RECOMMENDATION

5.1. Conclusion

This study has investigated the enabling environment for integration of community-based adaptation planning into spatial planning in Jakarta. First, this study reviewed a public participation exercise that was conducted in Marunda, North Jakarta, Indonesia, namely *Participatory Urban Neighbourhood Assessment* (PUNA). The involved NGOs utilised GIS technology to engage the community participating in the process to obtaining basic data towards the dissemination of community-based adaptation plan using Web-based GIS. The findings revealed that this PUNA process performed well in empowering community to develop their capacity to better adapt to hazards risks. By using Web-based GIS, community can report their activities and condition transparently and can be accessed publicly to promote inclusivity of information. However, the capability of community to use such technology is considerably low, only youths are capable of applying and sustaining the information. There is significant number of individuals in Marunda could not read maps. This can be attributed to the fact that they are mostly elderly. As such, this technology makes community who has potential to use more capable. At the same time, community who has not potential to use such technology become more deprived (Sieber, 2006). Youths are suggested not only to apply and sustain the information, but also disseminate the information within all community.

Secondly, this study examined to which extent the PUNA outputs satisfy community and local government geo-information needs. The examination of current practice with the aim for ensuring the needs, interests, and local concerns are taken into consideration. It contributes to strengthening the social relevance and validity of adaptation plan (Cloutier et al., 2014). The findings showed that there is need to update spatial information of PUNA outputs in order to fulfil the needs from community and local government such as conduits networks. In addition, the representation of information also should be increased since there are several vectors (such as lines and polygons) in PUNA maps render it difficult to read by community and local government. Regarding the satisfaction of both parties, community is considerably satisfied with the information that they have produced through PUNA process. Conversely, local government are reluctant about the credibility of information. They concerned on how community obtains the data and who is responsible (gatekeepers (Shanley et al., 2013)) for validating and then disseminating the information. There is need to involve local government in all process of obtaining the information (Cloutier et al., 2014). The involved NGOs have tried to involve institutions relevant to spatial planning. However, there are some barriers that make the involvement unsuccessful.

Thirdly, this study investigated the enabling environment for integration of PUNA outputs as community-based adaptation planning into spatial planning by focusing on the barriers that might influence the initiatives, using four components of capacity for joint action dimensions of collaborative governance. This study identified six barriers that influence the integration of PUNA outputs into spatial planning. These are; lack of institutional arrangements, leadership, knowledge, resources, behaviour, and technology. The findings argue that lack of knowledge and resources can be tackled by integrating community-based adaptation as well as enhancing collaboration amongst all stakeholders including community, local government, NGOs, and academicians through public participation. This research highlights leadership is the most critical factor for driving rapid change of institutional arrangement, building trust to the community and the community to the government, and embedding bottom-up adaptation planning into official spatial planning.

Moreover, to provide an enabling environment for community-based adaptation into spatial planning, there are several critical factors to be taken into consideration. There is a need for institutional change where local

government should be given authority to make a plan related to climatic uncertainty and how local level can adapt to hazard risks. Apart from that, the top-down development should be aligned with local-level needs. Adaptation issue is a local context which means that climate change and hazard impacts are experienced locally (Measham et al., 2011). Therefore, this study highlight a bottom-up adaptation output is vital to be considered and mainstreamed in spatial planning regarding building a resilient city. Leadership in local government is essential for these changes. There is need to increasing the acknowledgement of adaptation issues in spatial planning by local government also community. On the other hand, this study emphasised an issue on the integrated geospatial data amongst government institutions in Jakarta. The integrated geospatial data contributes not only to resolving technical issues, but also unifying those different sectoral interests.

5.2. Contribution to Policy-Making

By investigating an enabling environment for the integration of community participation outputs towards adaptation into spatial planning in Jakarta, this research provides reflections to the policy-making in Jakarta about the importance of bottom-up information for building resilience in city. The government of Jakarta need to take into consideration the role of local government in decision-making processes which is not only for delivering and implementing policies that have been made in the higher level but also providing authority to manage and plan for their administrative boundaries. It is highly required to sustain the city, the fact that every area or administrative has different problems that should be solved by local context, especially for mitigating hazards risks and climate change. Thus, government leadership needs to be able to solve institutional problems, including technical issues and enable a bottom-up process. Another recommendation for public participation is that to expand more collaboration with grassroots organisations and government institutions to have mutual trust, mutual understanding, legitimacy and commitment. Sharing trust to community is prominent to produce effective process. Especially for the government, it is highly recommended to establish the involvement of government from the beginning to the last of the project/process in order to ensure mutual commitment.

5.3. Recommendations for Future Research

This study provides an investigation of an enabling environment for integrating community-based adaptation planning into spatial planning in Jakarta. However, some gaps for future research still remain. First, this research found that there is institutional arrangement issue that influences the integration initiative of bottom-up planning into spatial planning. Little is still known about the specific influence of this factor. For instance, will the local government struggle to incorporate bottom-up products due to the unclear distinction of responsibilities amongst government institutions or lack of human resources? Or will they find it as opportunities to include NGOs and community participation to make robust bottom-up planning? Several studies are proposing methods to further analyse the social network dynamics of government institutions such as regulatory mapping (RegMAP) (Mardiah et al., 2017). It offers the assessment of the various regulations and legal documents to obtain an in-depth understanding on impact and potential problems. It also helps in defining responsibilities of government institutions. Second, the issue of government leadership affects less attention to community participation requires further attention from researchers, especially in learning on how to promote a bottom-up approach to decision-making processes.

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6. APPENDIX 1

Households Survey: Integrating Community Planning into Spatial Planning in Jakarta

Interview Location

Neighbourhood: 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐

No. Questionnaire: ____

Name of Interviewee: _____

Date (dd/mm/yy) : _____/_____/_____

Reference number on map: _____

Coordinate GPS: _____

Self-Introduction

Good morning/afternoon. My name is Arya Lahasa Putra and I am student from University of Twente, the Netherlands. I am here to do my thesis research which is about *integrating community planning into official spatial planning in Jakarta*. In this research, I am trying to find information about this area (geo-information needs) from community/local government. Therefore, I would like to ask you several questions about your socio-economic status and vulnerability and also hazards that frequently occurred in this area. I would like to know your opinion about hazards impacts and exposures and how you can adapt and mitigate from the hazards.

Confidentially statement

Before beginning the interview, I would like to remind you that this participation is voluntary. I know that you are busy and will try to be as brief as possible. The interview today should last about an hour. This interview is not part of an audit or a compliance review. We are interested in learning about your experiences and opinions about this area.

Would you like to participate in this interview ?

Thank you. In addition, before we start, I want to let you know that although we will take notes and audio record during these interviews, information is never repeated with the name of the respondent in any reports or in any discussions with supervisors, colleagues, or university. When we write our reports and discuss our findings, information from all the people we speak with is compiled and presented so that no one person can be identified.

Section A. Demographics

1. Gender of respondent ? A. Male B. Female
2. What is your age?
3. How long have you been living here?
4. What is your households size?

5. Education level of respondent?

☐ Primary Incomplete ☐ Vocational complete ☐ Master

☐ Primary complete ☐ Diploma I/II complete ☐ Doctor

☐ Junior High complete ☐ Diploma III complete

☐ Senior High complete ☐ Diploma IV/Bachelor complete

6. What is your occupation ?

7. How much is your income per month?

☐ < Rp.100.000

☐ Rp.100.001 – Rp.500.000

☐ Rp.500.001 – Rp.1.000.000

☐ Rp.1.000.001 – Rp.3.000.000

☐ Rp.3.000.001 – Rp.6.000.000

☐ > Rp.6.000.000

☐ Do not know

8. How much is your household expenditure per month?

☐ < Rp.100.000

☐ Rp.100.001 – Rp.500.000

☐ Rp.500.001 – Rp.1.000.000

☐ Rp.1.000.001 – Rp.3.000.000

☐ Rp.3.000.001 – Rp.6.000.000

☐ > Rp.6.000.000

☐ Do not know

Section B. Geo-Information Needs on Risk and Vulnerability

9. What hazards types frequently occur in this area? (tick more than one)

   ☐ Flooding ☐ Pests ☐ Others: _____

   ☐ Coastal Flooding ☐ Water Crisis

   ☐ Windstorm ☐ Garbage Piles

10. Can you give locations in map (attached) where the hazards happen? (Identify on the map the locations of disasters based on the types (mentioned in no.9))

11. Can you draw on the map the spatial extent of hazards impacts?

12. Can you explain, what are the assets/properties damaged by disasters mentioned above ?

13. Do you depend community network to survive when disasters occur ?

14. Is your livelihood depending on the weather?

    ☐ Yes ☐ No

15. If YES, Where do you usually get information about the weather ?

16. Do you frequently check the forecast before doing your activity? Why?

    ☐ Yes ☐ No

17. How do you access information about pre (before) disaster occurrence? (tick more than one)

Information Source	Tick
NGOs	
Chiefs	
Community members	
Radio	
Television	
Telephone	
Handphone	
Newspaper	
Access to Internet (social media)	
Others	

18. What source of information do you feel is easy to access when getting information about pre-disaster?

(tick more than one)

Information Source	Tick
NGOs	
Chiefs	
Community members	
Radio	
Television	
Telephone	
Handphone	
Newspaper	
Access to Internet (social media)	
Others	

Section C. Geo-Information Needs on Coping and Adaptation

19. What was the first thing you did after the last disasters occurred?

20. How much does it cost to repair/recover your assets/properties after the flood ?

- ☐ < Rp.100.000
- ☐ Rp.100.001 – Rp.500.000
- ☐ Rp.500.001 – Rp.1.000.000
- ☐ Rp.1.000.001 – Rp.3.000.000
- ☐ Rp.3.000.001 – Rp.6.000.000
- ☐ > Rp.6.000.000
- ☐ Do not know

21. What can you do to prevent your losses?

22. When disaster occurs, how can you evacuate yourself and your family to a safe place?

23. How do you access information about the evacuation routes?

24. Where do you access information about the evacuation shelters and capacities?

25. Based on your local knowledge of this area, can you give me locations in this map of areas that you feel safe to be as emergency shelters?

26. Can you Identify on the map the shortest and safest routes you can take to reach identifies safe place above?
27. What activities does the community engage in together, to address the impact of the hazards? (identify locations of community activities do together to adapt to hazards on the map)
28. Would you like to give me your phone number if there is some information need to be clarified?

Thank you for your participation!

7. APPENDIX 2

Interview with Chiefs
No. Questionnaire: ____
Name of Interviewee: _____
Date (dd/mm/yy) : _____/_____/_____
Reference number on map: _____
Coordinate GPS: _____

Self-Introduction

Good morning/afternoon. My name is Arya Lahasa Putra and I am student from University of Twente, the Netherlands. I am here to do my thesis research which is about *integrating community planning into official spatial planning in Jakarta*. In this research, I am trying to find information about this area (geo-information needs) from community/local government. Therefore, I would like to ask you several questions about your roles and responsibilities as chief of Hamlet 7th and also government system in Jakarta. I would like to know your opinion about how local community can be participated in decision-making process for community resilience towards climate change

Confidentially statement

Before beginning the interview, I would like to remind you that this participation is voluntary. I know that you are busy and will try to be as brief as possible. The interview today should last about 30 minutes. This interview is not part of an audit or a compliance review. We are interested in learning about your experiences and opinions about this area.

Would you like to participate in this interview ?

Thank you. In addition, before we start, I want to let you know that although we will take notes and audio record during these interviews, information is never repeated with the name of the respondent in any reports or in any discussions with supervisors, colleagues, or university. When we write our reports and discuss our findings, information from all the people we speak with is compiled and presented so that no one person can be identified.

1. What is your roles and responsibilities in community?
2. What is your roles and responsibilities in government system?
3. What is your role in relaying information from community to government?
4. Since you became chief, what do you think about relationship between government and community in Jakarta?
5. In your opinion, does local government provide a space for community to participate in decision-making process?
6. What is the main role of community in decision-making process?
7. What are the challenges faced by community in Marunda about their living conditions?
8. Based on the project from NGOs called MURIA, aimed at helping people in response to hazards impacts, what are the efforts that community and organisation did together to overcome the issues in this area?
9. In your opinion, are these activities efficient in building community resilience?

8. APPENDIX 3

Interview with Government

Self-Introduction

Good morning/afternoon. My name is Arya Lahasa Putra and I am student from University of Twente, the Netherlands. I am here to do my thesis research which is about *integrating community planning into official spatial planning in Jakarta*. In this research, I am trying to find information about the challenges of integration for community's initiative into spatial planning from local government perspective. Therefore, I would like to ask you several questions about your roles and responsibilities as decision-maker for addressing hazards impacts and government system in Jakarta.

Confidentially statement

Before beginning the interview, I would like to say thank for your time. I know that you are busy and will try to be as brief as possible. The interview today should last about 30 minutes. This interview is not part of an audit or a compliance review. We are interested in learning about your experiences and opinions about government system.

Would you like to participate in this interview ?

Thank you. Let me start.

Using Capacity for Joint Action Dimension

Institutional Arrangement

1. Can you describe your roles and responsibilities of your institution related to community resilience against hazards impacts?
2. Can you explain, does your institution collaborate with other institution to address hazards impact in community ?
3. What are the challenges you face in institution collaboration?
4. Can you explain, does your institution engage in collaborative activities with community (Marunda) in building resilience against hazards impacts?

Knowledge

5. Are you aware of potential hazards in Marunda community ?
6. Can you explain, does spatial planning consider the hazards impacts when upgrading existing municipal infrastructure ?
7. Can you tell me, does spatial planning consider the vulnerability of people when upgrading existing municipal infrastructure ?
8. What are the challenges you face in obtaining information from community ?

Leadership

9. Does the municipal spatial planning explain the support and involvement of emergency management?

10. Did the preparation of the municipal spatial planning involve a broad base of the community such as civil society and citizen ?
11. Does the municipal spatial planning provide a clear explanation of participation techniques used in its development ?
12. How do you inform people as early warning of hazard occurrence ?

Resources

13. Can you explain, is there budget allocation for support and involvement of community in decision-making process related to hazards impact reduction ?
14. Do you need outsourcing for the budget ?

9. APPENDIX 4

The result of participatory mapping in FGD

10. APPENDIX 5

FGD with Key Informants in Marunda

CHECKLIST

Component of Geo-Information Needs Checklist

Information	Indicators	Check
Hazard Identification	Type of hazard	
	Location	
	Magnitude/extent	
	Historical Occurrence	
	Frequency	
Vulnerability Assessment	Physical Impact	
	Socio-economic impact (livelihood)	
Emergency Management	Shelter demand and Capacity	
	Evacuation clearance time	
	Location emergency shelters	
	Evacuation routes	
Capacity Development (Economic resilience measures)	Urban Farming Culture Partnerships	

Phase 1 - Probing Vulnerability and Hazard Information

In this process, the interviewer tries to probe local spatial knowledge related to information of vulnerability and hazards. Image mapping (A0 size) will be used to help people identifying the location. The guide questions below are example of checklist that interviewer will use to guide the discussion.

1. What are the **type of disasters**? (categories: flooding, windstorm, coastal flooding, pests, water crisis, fire)
2. How **often do disasters** happen?
3. How large is the **area affected** by disasters (draw on map)?
4. Identify on the map the **disaster hotspot locations** (dangerous locations)
5. Identify the capacity development measures in these categories:
   - Urban Farming
   - Culture
6. How do they adapt to those disasters?
7. Identify on the map locations of emergency shelter.
8. Identify (draw) lines for evacuation routes that you know.

Phase 2 – Probing Adequacy of PUNA outputs

This process will use online maps from website (https://openstreetmap.id/muria) that the involved NGOs produced from PUNA process. Photovoice method will be used to help discussing information on several maps from PUNA outputs. Several guidance questions will be provided.

1. Identify the difference between PUNA map and map done in section one. (Categories: missing points, correct points, wrong points)
2. Identify the gaps in the following categories:
   - Urban Farming
   - Culture
   - Preparedness issues (evacuation shelters, roads, that you mentioned before)
3. What more information do you want to have on the map about disasters?
4. What more information do you want to have on the map about emergency management (evacuation shelter and capacity, evacuation time, shortest routes, safest locations)

Thank you for your participation!

11. APPENDIX 6

Table 9. Semi-structured Interview Respondents

No	Respondents	Hamlet	Gender	Age	Living Duration (year)	Number of Family	Education	Occupation	Income per Month	Expenses per Month
1	Anonymous 1	1	Male	29	29	8	High School	Employee	3,000,001 - 6,000,000	3,000,001 - 6,000,000
2	Anonymous 2	1	Male	57	57	3	Unfinished Primary School	Fisherman	-	1,000,001 - 3,000,000
3	Anonymous 3	1	Female	42	42	5	High School	Housewife	-	3,000,001 - 6,000,000
4	Anonymous 4	1	Female	52	32	3	High School	Housewife	3,000,001 - 6,000,000	3,000,001 - 6,000,000
5	Anonymous 5	1	Male	52	15	6	Junior High School	Security	3,000,001 - 6,000,000	3,000,001 - 6,000,000
6	Anonymous 6	2	Female	56	35	5	Junior High School	Housewife	3,000,001 - 6,000,000	3,000,001 - 6,000,000
7	Anonymous 7	2	Female	52	52	4	Primary School	Housewife	500,001 - 1,000,000	1,000,001 - 3,000,000
8	Anonymous 8	2	Female	33	33	6	Primary School	Housewife	3,000,001 - 6,000,000	3,000,001 - 6,000,000
9	Anonymous 9	2	Male	57	57	6	Unfinished Primary School	Labour	1,000,001 - 3,000,000	3,000,001 - 6,000,000
10	Anonymous 10	2	Male	67	38	4	Primary School	Small entrepreneur	1,000,001 - 3,000,000	1,000,001 - 3,000,000
11	Anonymous 11	3	Female	28	9	4	Junior High School	Housewife	3,000,001 - 6,000,000	3,000,001 - 6,000,000
12	Anonymous 12	3	Female	39	39	4	Primary School	Small entrepreneur	-	3,000,001 - 6,000,000
13	Anonymous 13	3	Male	55	37	6	High School	Security	3,000,001 - 6,000,000	3,000,001 - 6,000,000
14	Anonymous 14	3	Male	53	53	6	Primary School	Fisherman	-	-
15	Anonymous 15	3	Female	68	68	5	Unfinished Primary School	Fishmonger	100,001 - 500,000	100,001 - 500,000
16	Anonymous 16	4	Female	50	50	4	Unfinished Primary School	Housewife	3,000,001 - 6,000,000	3,000,001 - 6,000,000

17	Anonymous 17	4	Female	33	33	4	Primary School	Small entrepreneur	1,000,001 - 3,000,000	500,001 - 1,000,000
18	Anonymous 18	4	Female	33	25	2	Junior High School	Housewife	1,000,001 - 3,000,000	1,000,001 - 3,000,000
19	Anonymous 19	4	Male	44	44	4	Unfinished Primary School	Fisherman	-	3,000,001 - 6,000,000
20	Anonymous 20	4	Male	52	25	11	Unfinished Primary School	Fisherman	1,000,001 - 3,000,000	3,000,001 - 6,000,000
21	Anonymous 21	5	Male	58	58	6	Primary School	Small entrepreneur	500,001 - 1,000,000	1,000,001 - 3,000,000
22	Anonymous 22	5	Male	26	5	0	Diploma III	Unemployed	-	-
23	Anonymous 23	5	Male	18	18	4	Junior High School	Security	1,000,001 - 3,000,000	1,000,001 - 3,000,000
24	Anonymous 24	5	Female	23	2	3	Junior High School	Housewife	1,000,001 - 3,000,000	1,000,001 - 3,000,000
25	Anonymous 25	5	Female	53	42	5	Primary School	Housewife	< 100,000	500,001 - 1,000,000
26	Anonymous 26	5	Female	41	41	4	Primary School	Housewife	1,000,001 - 3,000,000	1,000,001 - 3,000,000
27	Anonymous 27	6	Female	46	46	4	Primary School	Housewife	100,001 - 500,000	500,001 - 1,000,000
28	Anonymous 28	6	Female	60	32	7	Unfinished Primary School	Small Entrepreneur	100,001 - 500,000	500,001 - 1,000,000
29	Anonymous 29	6	Female	55	55	13	Primary School	Housewife	3,000,001 - 6,000,000	1,000,001 - 3,000,000
30	Anonymous 30	6	Male	48	2	3	High School	Small entrepreneur	1,000,001 - 3,000,000	> 6,000,000
31	Anonymous 31	6	Female	57	30	2	High School	Housewife	100,001 - 500,000	500,001 - 1,000,000
32	Anonymous 32	7	Male	37	37	4	Junior High School	Security	3,000,001 - 6,000,000	3,000,001 - 6,000,000
33	Anonymous 33	7	Female	39	22	5	Primary School	Small entrepreneur	-	1,000,001 - 3,000,000
34	Anonymous 34	7	Female	50	15	5	High School	Housewife	-	3,000,001 - 6,000,000

33	Anonymous 33	7	Female	39	22	5	Primary School	Small entrepreneur	-	1,000,001 - 3,000,000
34	Anonymous 34	7	Female	50	15	5	High School	Housewife	-	3,000,001 - 6,000,000
35	Anonymous 35	7	Female	35	20	4	Primary School	Housewife	-	100,001 - 500,000
36	Anonymous 36	7	Male	52	47	7	Primary School	Driver	-	1,000,001 - 3,000,000
37	Anonymous 37	7	Male	24	24	4	Junior High School	Labour	3,000,001 - 6,000,000	3,000,001 - 6,000,000
38	Anonymous 38	8	Male	54	17	2	Unfinished Primary School	Fisherman	-	-
39	Anonymous 39	8	Female	38	14	3	High School	Housewife	-	3,000,001 - 6,000,000
40	Anonymous 40	8	Male	40	40	6	Primary School	Fisherman	1,000,001 - 3,000,000	1,000,001 - 3,000,000
41	Anonymous 41	9	Male	66	40	10	Unfinished Primary School	Fisherman	500,001 - 1,000,000	500,001 - 1,000,000
42	Anonymous 41	9	Female	22	14	3	Primary School	Small entrepreneur	1,000,001 - 3,000,000	1,000,001 - 3,000,000
43	Anonymous 43	9	Male	59	35	4	Primary School	Pension	-	-
44	Anonymous 44	9	Male	43	1	6	Junior High School	Fisherman	1,000,001 - 3,000,000	1,000,001 - 3,000,000
45	Anonymous 45	9	Male	39	39	4	Primary School	Fisherman	-	-

Clusters

Input (Predictor) Importance

1.0 0.8 0.6 0.4 0.2 0.0

Cluster	2	1
Label	Female with occupation and ...	Male with occupation and education level
Description	Majority females in Maunda are housewives and have low level of education (primary school)	Most of male respondents in Marunda are fisherman with low level of education (primary school)
Size	51.1% (23)	48.9% (22)
Inputs	Gender Female (100.0%)	Gender Male (100.0%)
	Occupation Housewife (73.9%)	Occupation Fisherman (40.9%)
	Age 43.70	Age 46.82
	Education Primary School (47.8%)	Education Primary School (31.8%)