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## Households Perceptions on Factors Affecting Resilience towards Natural Disasters in Indonesia

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# HOUSEHOLDS PERCEPTIONS ON FACTORS AFFECTING RESILIENCE TOWARDS NATURAL DISASTERS IN INDONESIA

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*Most areas in Indonesia are prone to natural disasters. Learning the lessons from the Aceh Tsunami in 2004, areas with high risks of natural disasters are in the process of preparing themselves for such an unexpected event, by increasing their resilience. The objective of this study is to shed more lights on factors affecting the resilience from two sources namely, existing literatures and the application of disaster management in four disaster-prone areas in Indonesia -Padang, Sleman, Cilacap, and Palu. To enrich our analysis, we collect data from the field to compare the preparedness and to get insights on people's perceptions towards the factors of resilience in those areas. We employ IDI and FGD to identify the factors of resilience and the preparedness in the areas investigated. Thereafter, a preliminary survey is conducted to identify people's perceptions towards the aspects of resilience in the areas. Results from the survey conducted to 800 households in Padang and Cilacap indicates that from the social aspect, community's value cohesiveness is one of important factor affecting their resilience towards natural disaster. In addition, since almost 85 percent of their income was spending to fulfill their daily basic needs such as foods, clothing, and housing. Therefore, when disaster occurred, they heavily relied on the help of debt or selling some of their assets, as well as used cash in hand as emergency funds. In general, respondents in all sample cities are able to re-start their economic activities as soon as two weeks after the event of disaster. In addition, the survey found that most of respondents were aware that the government has programs to educate people on the disaster mitigation.*

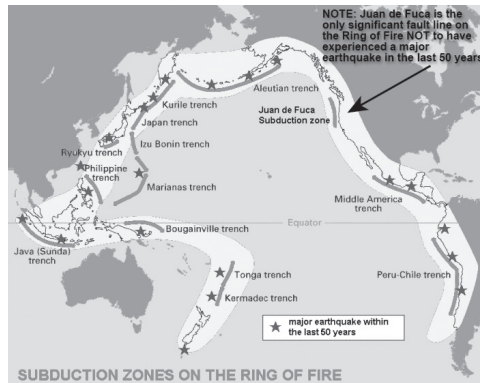
## Abstract



*Keywords: Natural Disaster, Resilience, Preparedness, Indonesia*

Indonesia is one of many countries with high risks of natural disasters, particularly earthquakes, due to the fact that this country is located between three active earth faults: the Pacific, Indo-Australian, and Eurasian (See Figure 1).

Each plate in the fault moves with different speed and directions. The comovement of these three faults causes higher tectonic and volcanic activities in Indonesia. As shown in Figure 2, most of areas are covered with active volcanoes which eruptions since 1900



Source: <http://x-poeroe.blogspot.com/2010/05/ring-of-fire-threats-or-opportunities.html>

Figure 1. The Ring of Fire Area



Source: <http://feww.wordpress.com/2011/07/03/>

Figure 2. Volcanoes in Indonesia

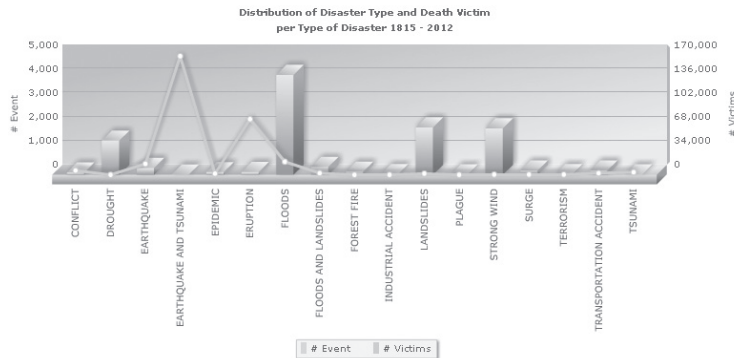
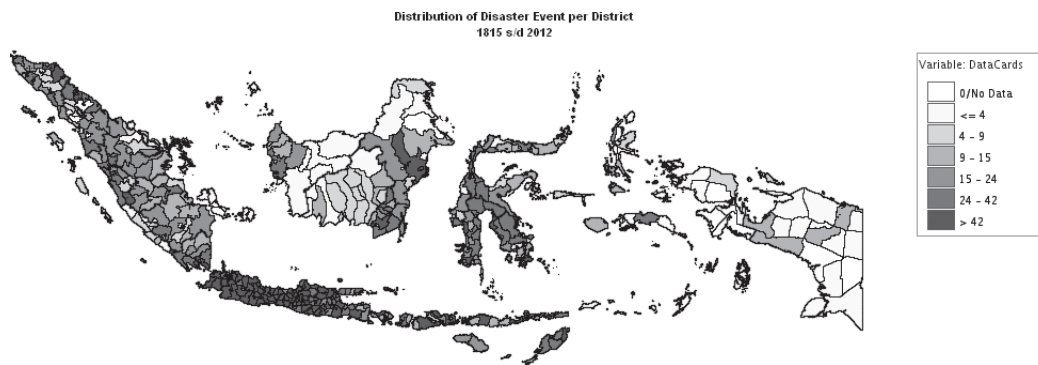


Figure 3. Distribution of Disaster Events in Indonesia (BNPB, 2012)

A.D, and caused significant impact on many aspects on residents in surrounding areas.

There were 9,555 events of disasters in the period of 2000-2010 with 187,062 numbers of dead casualties (BNPB,

2012). Figure 3 presents types of natural disasters and number of victims. It is shown that floods are the most frequent disasters occurred in Indonesia since 1815; however earthquakes and tsunamis, as well as volcano eruptions bring more dead casualties.



Source: BNPB, 2012

Figure 4. Distribution of Disasters Events per District

Figure 4 presents the distribution of disaster events per districts in Indonesia. It shows that most of districts were affected by the disasters, especially in Sumatera, Java, and Sulawesi. Due to the significant impact of disasters on the three islands, this study aims to investigate the household perception of the residents in the disasters prone areas in Padang (Sumatera), Cilacap, Sleman (Java) and Palu (Sulawesi).

#### *Characteristics of Cilacap, Padang, Palu, and Sleman*

A brief description of four disaster prone areas that are the object of our research is presented as follows.

##### ***Cilacap***

Cilacap is the largest district in Central Java with an area of 2142.59 km<sup>2</sup>. Cilacap has 24 sub districts. Since the district has been affected by many types of natural disasters, it is also popular as a *supermarket of disaster*. The most common natural disasters occurred are: high-tide (tsunami), landslides, earthquakes, draught, and floods. The two last natural disasters that hit Cilacap and have significant impact were the earthquakes which happened on the 17<sup>th</sup> of July, 2006 with magnitude of 7.7 on the Richter

scale in the coastal area of the Southern Java, and earthquake with 5.1 on the Richter Scale on 14<sup>th</sup> July 2012. The earthquakes generated tsunami that cause 500 people died, and caused disasters (DLR/GTZ, 2010). Based on the condition of the infrastructure and disaster management infrastructure, Cilacap poses the most complete infrastructure to support the preparedness of the disaster events among other areas. For example, it has 5 hospitals and 81 community clinics, and 46 shelters to be used in the event of disasters. In addition, it also has the highest number of early warning system.

##### ***Padang***

The city of Padang consists of 11 sub districts (including 19 islands), namely Bungus Teluk Kabung, Lubuk Kilangan, Lubuk Begalung, Padang Selatan, Padang Timur, Padang Barat, Padang Utara, Nanggalo, Kuranji, Pauh dan Koto Tengah. The highly dense sub districts are Lubuk Begalung, Kuranji and Koto Tengah while Bungus Teluk Kabung is the sub-district with the lowest density.

The city of Padang is the capital of West Sumatra province in the island of Sumatra. Padang consists of 11 sub

districts, and the city experienced the devastating West Sumatra earthquake with 7.9 Richter scale in the year 2009, with the total number of dead casualties of 383 people. In order to anticipate the event of natural disaster, the city of Padang had two government policies. First is the Mayor's Act No. 14, 2010 by its stakeholders. Second, the Mayor's act No. 25 Year of 2011 [6] stated that BPBD serves as the main coordinator of other government institutions and other organizations such as PMI and NGOs in the disaster management.

In terms of infrastructure, the city of Padang has developed the BMKG has already been equipped with early warning system for Tsunami. There exist 10 Tsunami sirens; Radio and 30 RABAB (radio antisipabahayabencana, megaphones at mosques) also help disseminating disaster information to the people. The local authority has also established 39 horizontal evacuation paths to the safety zone, and the 16 shelters for vertical evacuation. Along the horizontal evacuation path, 120 evacuation signs have already been established to disaster victims to the safety zone. In the year 2012, 170 additional signs will be put along the evacuation paths. To support the distribution of relief supplies during the response stage of disaster management, currently there are three logistics warehouses in Padang, owned by BPBD, PMI, and Dolog (Logistics Depot).

### **Palu**

The city of Palu is the capital city of Central Sulawesi province. Since 2012, the city of Palu consists of 8 sub districts, namely Palu Barat, Palu Timur,

Palu Utara, Palu Selatan, Tatanga, Ulujadi, Mantikulore and Tawaeli. The city is prone to some types of natural disasters such as earthquakes, floods and tsunami. However, the city is prone especially to earthquake. It is located above the PaluKoro Fault, which is caused by the meeting and movement of three tectonic layers (Eurasian, Australian, and Pacific). The city of Palu experienced earthquake which was 6.2 in the Richter scale on 24 January 2005.

In the year 2011, Local Act No. 5 year 2011 regarding disaster management implementation in Palu has been issued. The Act describes the roles of local government, the Regional Agency for Disaster Management (BPBD), the community, business organizations, social organization and foreign organization in disaster management in the city of Palu. BPBD Palu was founded in 2009 based on the Local Act No. 2 Year 2009. Furthermore, Local Act No. 6 year 2011 regarding building structure that includes an article on requirements for earthquake-proof building structure has been issued. In terms of the infrastructure of disaster management, the city of Palu has one unit early warning system, and four units of logistic warehouses. However, there are neither horizontal nor vertical evacuation paths nor buildings available.

### **Sleman**

Sleman is located in northern of Boyolali district, east by Klaten, west of the border with Kulon Progo, and Southern of Yogyakarta. Sleman is one area in Special Province of Yogyakarta that hit by natural disaster, especially volcano eruption and earthquake. The

district experienced the eruption of Mount Merapi in the year 2010, with the total number of dead casualties of 277 people.

As of in Padang, Concerning the district of Sleman, in 2011, the Mayor of Sleman issued Act No. 54 regarding the roles and responsibilities of BPBD Sleman in disaster management. This Act stated the roles and work standard of the BPBD's. In terms of the disaster management infrastructure, the district of Sleman has also been provided with standard tools such as early warning system, evacuation signs, and a logistic warehouse. However, there is no information on the availability of horizontal neither vertical evacuation buildings.

There is no doubt that natural disasters bring significant impact to many aspect of life to the residents in the damaged areas. Furthermore, the recovery from such a tremendous event takes considerable of time. Disaster is usually classified based on its cause, namely natural (e.g. tsunami, earthquake and volcano eruptions) and technological (e.g. industrial and transport accidents). The cycle of disaster management consists of four stages: mitigation, preparedness, response and rehabilitation (Tommasini and van Wassenhove, 2009). Mitigation deals with the proactive social component of emergencies. Preparedness denotes implementing the response mechanisms to counter factors that the society has not been able to mitigate. Response comprises the provision of assistance or intervention during or immediately after a disaster took place to meet the life preservation and basic subsistence needs of the affected people. The rehabilitation stage,

in particular, is related to making decisions and taking actions after a disaster that aims at restoring or improving the pre-disaster living conditions of the affected community, while encouraging and facilitating essential adjustments to reduce the disaster risk.

The recovery period is the length of time necessary to restore the functionality of a structure, an infrastructure system (water supply, electric power, etc., or a community), to a desired level that can function close to, the same, or better than the pre-disaster conditions (Cimellaro et al., 2010). One of the aspects that determine the recovery period of an area stricken by a natural disaster is its resilience towards the disaster. Mileti (1999) suggested that resilience was the ability of a community to recover by means of its own resources, while Paton (2006) defined resilience as a measure of how well people and societies can adapt to a changed reality and capitalize on the new possibilities offered.

Given their significant impact, it is important to determine the resilience towards natural disasters in a country's areas. A deep understanding on the resilience towards a natural disaster will help government to develop a comprehensive framework or policy to minimize the negative effect of disasters.

Therefore, the purpose of this study is twofold. Firstly to identify factors affecting the resilience toward natural disasters in four disaster prone areas in Indonesia (Cilacap, Padang, Palu, and Sleman), and secondly to compare preparedness and gain insights regarding the household perceptions on the identified factors in those areas.

The rest of this paper is organized as follows: Section 2 provides relevant literature pertaining to resilience and preparedness towards natural disasters. Section 3 explains the research methodology. Section 4 describes the research findings. Lastly, conclusion of the findings and the implications are presented in Section 5.

## LITERATURE REVIEW

The United Nations International Strategy for Disaster Reduction (UNISDR) defines resilience as:

“The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.”

Resilience means the ability to bounce back from a shock, and it is determined by the degree to which the community has the required resources and is capable of organizing itself prior to and during the times of need (UNISDR, 2012).

Disaster resilience along with economic vitality, environmental quality, social and inter-generational equity, quality of life, and participatory process are the six principles of sustainability (Natural hazard Centre, 2006). According to Birkmann (2006), measuring vulnerability is increasingly being seen as a key step toward effective risk reduction and the promotion of a culture toward disaster resilience.

Norris et al. (2008) viewed resilience as adaptive capacities (such as social

capital and economic development) that can be fostered to enhance the ability to recover from disasters, Kahan et al. (2009) assumed that resilience was an outcome measure related to critical infrastructure.

According to Bruneau et al. (2003) resilience consist of four inter-related dimensions, namely technical, organizational, social, and economic. The technical and organizational dimensions are related to the performance and resilience of critical systems such as utilities and hospital, whereas the social and economic dimensions are most pertinent to the performance and resilience of the community as a whole (Chang and Shinozuka, 2004).

Simpson (2006) argued that the indicators of resilience are community assets, social capital, infrastructure/system quality, planning, social services, and population demographics.

Razafindrabe et al. (2009) found that there are five dimensions of resilience towards disaster (in this case is climate disaster). They are physical (e.g. electricity, water supply, sanitation, etc.), social (health status, education and awareness, social capital), Economic (e.g. income, employment, households' assets, etc.), institutional (e.g. internal institution and development plan, effectiveness of internal institutions, etc.), and natural (hazard frequency and hazard density)

Paton and Johnston (2001), on the other hand, show that community resilience towards disaster required safeguarding the physical integrity (e.g. building codes), ensuring the continuity of economic, business and adminis-

trative (including emergency management and social institutions), and also ensuring that the community members have the resources, capacities and capabilities necessary to utilize the physical and economic resources to minimize disruptions.

Lastly, indicators of community resilience includes several dimensions, such as ecological (e.g. erosion rates and biodiversity), social (e.g. demographics, and social networks), economic (e.g. employment and value of property), institutional (e.g. hazard mitigation plan and emergency response plans), infrastructure (e.g. transportation network and residential housing stock and age) and community competence (e.g. local understanding of risk and health and wellness) (Cutter et al. (2008) and Cutter et al. (2010)).

Quantarelli (1981) and Simpson (2006) states that resilience is a function of community preparedness and vulnerability (i.e. The community's exposure to the disaster). There are some definitions of the disaster preparedness. For example, the European Commission Humanitarian Aid Office (ECHO) defined preparedness as:

*The organizational activities which ensure that the systems, procedures and resources required to confront a natural disaster are available in order to provide timely assistance to those affected, using existing mechanisms wherever possible.*

These activities may include building the stakeholders' awareness, establishing disaster evacuation plans, set the early warning mechanisms,

as well as strengthening people knowledge (ECHO, 2012).

In addition, Sutton and Tierney (2006) suggest that preparedness is a critical factor for households, business, and the community. For example, households need to understand the vulnerability and disaster preparedness to improve their life safety, to protect their property protection, and to survive from hazardous events. Furthermore, business sector as the locomotive of the economy may directly and/or indirectly involved in crisis-relevant activities at the time of disasters, in term of disaster response through contracts and mutual aid agreements. Moreover, the community represented by the local political jurisdiction (municipal government, city government, county government) is responsible for emergency preparedness, emergency alert and notification, as well as emergency response and recovery (Sorensen and Rogers, 1988).

Therefore, there are at least three factors that affect preparedness towards disaster, i.e: households, organizations and communities (Sorensen and Rogers, 1988). Takao *et al.* (2004) indicated different factors that affect people preparedness for natural disaster in the case of the Tokai floods in Japan. They suggested three important factors: ownership of home, fear of flood, and the amount of damage from the previous event will affect people's preparedness towards natural disasters

## RESEARCH METHOD

This study employed a survey with 50 sample households in each of the four disaster-prone areas in Indonesia, with total sample of 200 households.



Table 1. Institutions Involved in IDIs

Sleman	Padang	Cilacap	Palu
BPBD Yogyakarta	BPBD Padang	BPBD Cilacap	BPBD Palu
Division of Health	Division of Social Welfare	Division of Social Welfare	Division of Social Welfare
Division of Public Works	Division of Public Works	Division of Health	Division of Health
PMI	PMI	PMI	Division of Public Works PMI

Table 2. Participants of FGDs

Participants	Padang (persons)	Sleman (persons)	Cilacap	Palu
NGOs	3	2	3	4
Community Leaders	1	2	3	3
Business Community	2	2	1	2

Table 3. Factors Affecting the Resilience Towards Natural Disasters (IDIs and FGDs results)

Dimensions	Factors
Institutional	<ul style="list-style-type: none"> <li>• Leadership, initiatives &amp; capability of local authority</li> <li>• The quickness to respond to a disaster and rehabilitate the infrastructure</li> <li>• Mitigation plan</li> <li>• The capacity of human resources of the local authority</li> <li>• Regulation regarding building license, debts management and protections for SMEs in the affected areas</li> <li>• Cooperation with other government institutions, NGOs and the community</li> <li>• The policy to protect the environment</li> </ul>
Social & community	<ul style="list-style-type: none"> <li>• Initiative of community leaders &amp; the people</li> <li>• Characteristics and values of the community</li> <li>• People demography</li> <li>• People’s awareness of disasters risk and mitigation</li> <li>• The existence of disaster watchdog community</li> </ul>
Economic	<ul style="list-style-type: none"> <li>• The number of ways to earn living</li> <li>• Level of income</li> </ul>
Infrastructure	<ul style="list-style-type: none"> <li>• Infrastructure for disaster management</li> <li>• The quickness to recover transportation infrastructure</li> </ul>
Hazard	<ul style="list-style-type: none"> <li>• The type of disaster occurred</li> <li>• Environment condition</li> <li>• Level of hazard</li> </ul>

The survey was conducted to elaborate the respondents’ perception on factors affecting resilience towards natural disaster in Indonesia.

The questionnaire for the survey is developed based on *in depth interviews*(IDIs) and *focus group discussions* (FGDs)with parties that usually involved in disaster management. We interviewed representatives from: BadanPenanggulanganBencana Daerah Tingkat II (BPBD/Agency for Disaster Management at the District Level); PalangMerah Indonesia tingkatkota (PMI/Indonesia Red

Cross at the district level); DinasSosial Daerah Tingkat II (Dinsos/Division of Social Welfare at the district level);DinasPekerjaanUmum Daerah Tingkat II (DinPU/Division of Public Works at the district level); and DinasKesehatan Daerah Tingkat II (Dinkes/Division of Health at the district level).

The participants for FGDs include representatives from community/religious leaders, NGOs and small and medium enterprises (SMEs), as presents in Table 2.

## Findings and Discussion

Based on IDIs and FGD held to those respective institutions, we disseminate a list of questions to gather information about the perception of households living in the disaster-prone areas in four cities. The results are presenting in the following sections.

### a. Factors Affecting Resilience towards Natural Disasters

Based on the literature review, the dimensions of resilience are social and community, economic, institutional, infrastructure, and hazard. They can be further classified into the preparedness and vulnerability aspects of the area. For instance, hazard frequency is related to vulnerability, hazard mitigation plan is related to preparedness, while community competence can either related to preparedness or vulnerability.

We asked the IDIs interviewees and the FGDs participants their perspectives regarding factors determining the resilience of the areas that they were living in, based on their past experience witnessing the recovery process from the 2009 West Sumatra earthquakes and the 2010 Mount Merapi eruptions, 2006 Southern Java earthquake, and the 2005 Palu earthquake. The results of IDIs and FGDs in the abovementioned areas are presented in the Table 3.

As presents in Table 3, the IDIs interviewees and the FGDs participants in four areas agree that leadership, time to respond and rehabilitate the infrastructure, mitigation plan as well as regulation is among the important factors of institutional aspect of resili-

ence towards natural disasters. They also agree with the important of disaster watchdog community and the existence of community leaders as important social factors. Furthermore, in terms of economics, infrastructure and hazard dimensions, the interviewees and FGD's participants share a common opinion on the important of family income, infrastructure for disaster management, and types of disaster as well as the level of hazard.

Based on findings from Table 4 to Table 6 it can be concluded that in terms of policy, the sample areas already had formal policies in mitigating natural disasters. Each of local government already established such local authority Acts that stated roles and responsibilities of Agency for Disaster Management at the District Level (BPBD). Furthermore, in terms of infrastructure, all areas equipped with logistic warehouses, sirens and shelters in every villages. All areas have provided both vertical and horizontal evacuation paths, whilst Sleman only provides horizontal paths. To educate communities on how to deal with disasters when they occurs, BPBD along with volunteers from informal and non-government organizations conducted trainings and evacuation simulation regularly in every village. In addition, Cilacap is found to be more prepared than the other area in terms of financial readiness. Finally, people awareness of the disaster risk largely built by the help of KSB, a semi-formal organizations.

### b. Households' perceptions on factors of resilience

This section reports finding from the survey held to collect primary data

Table 4. Disaster Management Policy of the Local Authority

Aspects	Padang	Sleman	Cilacap	Palu
Policy	<ul style="list-style-type: none"> <li>- Mayor's Act No. 14 Year 2010 (SOP for early warning system for Tsunami)</li> <li>- Mayor's Act No. 25, 2011 (SOP for disaster management, states the roles of all stakeholders of Padang)</li> </ul>	<ul style="list-style-type: none"> <li>- Mayor's Act No. 54, 2011 (states the role and responsibility of the BPBD)</li> </ul>	<ul style="list-style-type: none"> <li>- Local Act No. 22 year 2008 (states the role and responsibility of the BPBD).</li> <li>- Local Act No. 11 year 2009 (States the role of local government in handling social welfare of the victims, as well as determined the related policies needed in disaster mitigation)</li> </ul>	<ul style="list-style-type: none"> <li>- Local ActNo.5 year 2011 (SOP for disaster management, states the roles of all stakeholders of Palu)</li> <li>- Local Act No. 6 year 2011 (regarding building structure that includes an article on requirements for earthquake-proof building structure)</li> </ul>
Infrastructure	<ul style="list-style-type: none"> <li>- The availability of vertical and horizontal Evacuation paths</li> <li>- 3 logistics warehouses</li> <li>- EWS: 10 Tsunami sirens,</li> <li>- 30 RABAB (mosque's speaker)</li> <li>- 39 horizontal evacuation paths</li> <li>- 16 shelters for vertical evacuation</li> <li>- 120 evacuation signs (by the year of 2012)</li> </ul>	<ul style="list-style-type: none"> <li>- Horizontal evacuation path</li> <li>- 1 logistics warehouse</li> <li>- Shelters in every village</li> <li>- Sirens for evacuation is available</li> <li>- Evacuation signs are available</li> </ul>	<ul style="list-style-type: none"> <li>- The availability vertical and horizontal evacuation path</li> <li>- 1 logistics warehouse</li> <li>- EWS: 7 units of Tsunami sirens</li> <li>- 100 evacuation signs (by the year of 2011)</li> <li>- 46 shelter for vertical evacuation</li> </ul>	<ul style="list-style-type: none"> <li>- Vertical and horizontal evacuation paths are not available</li> <li>- 4 logistics warehouses</li> <li>- EWS: 1 unit of Tsunami siren</li> <li>- The evacuation routes have been stated in Local Act No. 16 Year 2011, however evacuations signs are not available yet</li> <li>- Shelters have not been yet determined, however, recommendation of safety zones (for temporary shelters) for flood, landslide, earthquake and Tsunami has been submitted to BNPB</li> </ul>
Education	<ul style="list-style-type: none"> <li>- BPBD, Dinsos, PMI, Non Governmental Organizations (NGOs) are involved in educating the local people regarding the disaster risk and its mitigation</li> <li>- 17 Evacuation simulations and socializations</li> <li>- Training for 10 Representatives from all urban village in Padang</li> </ul>	<ul style="list-style-type: none"> <li>- BPPD conducts training and simulation as anticipation of disaster in every village in Yogyakarta since 2011</li> <li>- Dinsos, Dinkes, PMI, and NGOs also conduct training and socialization for the people</li> <li>- The disaster community (community groups for disaster mitigation) is involved in developing the contingency plan</li> </ul>	<ul style="list-style-type: none"> <li>- BPBD in collaboration with several institutionsocializes and educates community representatives through training for trainers (TOT). The trainees are expected to replicate the training to the people, so that community itself is able to develop the contingency plan</li> <li>- BPBD in collaboration with NGO conducts socialization of earthquake-proof building structure to the people</li> <li>- PMI also conduct education/ socialization to the people (community/ religious leaders, students, company)</li> </ul>	<ul style="list-style-type: none"> <li>- BPBD has formed Disaster Forum (Forum PeduliBencana, FPB) in the sub districts and urban villages that are prone to disasters.</li> <li>- Socializations of preparedness to the heads of sub districts and urban villages have been conducted by BPBD in every sub district</li> <li>- Socialization to the people have been carried out through FPB and via television (TVRI) and radio (RRI)</li> </ul>

Table 4. Disaster Management Policy of the Local Authority (continued)

Aspects	Padang	Sleman	Cilacap	Palu
Networking with other institution	<ul style="list-style-type: none"> <li>- Regular Meeting with local NGOs (36 organizations with total members of 6000 people)</li> <li>- Coordinate with business community for evacuation simulation and donation</li> <li>- University students in the event of disaster</li> </ul>	<ul style="list-style-type: none"> <li>- TRC (team that consists of BPBD, PMI, Dinkes, Dinsos, community, and student) to respond to a disaster the first time it occurs, and provide assessment report on the effect of disaster in the hit areas</li> </ul>	<ul style="list-style-type: none"> <li>- BPBD along with other institutions such PMI, DinPU, Dinkes, and Dinsos, established a SOP and Memorandum of Understanding (MoU) in carrying out disaster mitigation</li> <li>- BPBD also coordinates with local government, NGOs and other voluntary groups to formulate disaster management regulation and conduct disaster simulation</li> </ul>	<ul style="list-style-type: none"> <li>- BPBD coordinates with NGO to conduct socialization and education of disaster risk and mitigation</li> <li>- BPBD coordinates with other government institutions, NGO, and foreign institution in disaster mitigation and preparedness</li> </ul>
Budget for Disaster	<ul style="list-style-type: none"> <li>- BPBD, Dinkes, and Dinsos (Division of social welfare) from APBD (Local government budget)</li> <li>- DinPU: No special budget allocation for disasters event, but used regular budget</li> <li>- PMI : No special budget allocation for disasters event. PMI will directly distribute the relief supplies from donators or from PMI headquarters</li> </ul>	<ul style="list-style-type: none"> <li>- BPBD: from BNPB (when disaster occurred)</li> <li>- Dinsos: from operational budget in APBD</li> <li>- DinPU: No special budget allocation for disaster. In the event of a disaster, routine operational budget is used</li> <li>- PMI: there is a special emergency fund. If it is not sufficient, if it not sufficient, they can ask for financial support from PMI at the higher level (province, national or ASEAN).</li> </ul>	<ul style="list-style-type: none"> <li>- BPBD: mainly from APBD</li> <li>- Dinkes: No special budget allocation for disaster. In the event of a disaster, the day-to-day operation budget (from APBD and Ministry of Health) is used</li> <li>- PMI: PMI Cilacap, donation months, saving funds of PMI at sub-district level, and the PMI at the Province level, APBN</li> </ul>	<ul style="list-style-type: none"> <li>- BPBD: from APBD</li> <li>- Dinsos: APBD at the province level (when disaster occur)</li> <li>- DinPu: there is limited budget allocation for disaster mitigation</li> <li>- PMI: from PMI at the province level (when disaster occur)</li> </ul>

and information from the community to examine household's perceptions on factors affecting resilience towards disaster management in four areas in Indonesia. The questionnaire was developed based on the results from IDI and FGD that previously held in the areas, as well as from the previous studies. Fifty questionnaires were distributed to get insights and confirmation from the respondents in relation with disaster management practices in each area.

The questionnaire is divided into five sections, i.e: social aspect, including demography or the characteristics of

the respondents, economics aspects, institutional aspects, infrastructural aspects, and community competence aspects.

### *Social aspects*

Results from the social aspects of resilience indicate that the preparedness of the people who live in the disaster-prone areas is significantly affected by community values cohesiveness supported by communication systems provided by the local government such as sirens. In addition, the empathy, solidarity and the ability to help among

Table 5. People’s Awareness of Disaster Risk and its Mitigation

Aspects	Padang	Sleman	Cilacap	Palu
Disaster Risk	- Most of the community members are aware of disaster risk	- Most of the community members are aware of disaster risk	- Most of the community members are aware of disaster risk.	- Most of the community members are aware of disaster risk
Disaster Mitigation	- KSB provides first response for evacuation as mediators between the institutions and people - KSB are involved in monitoring and maintaining the evacuation signs - Community leaders (for instance ninikmamak) play an important role	- For evacuation, coordination among government, city Red Cross, private organizations, and community leaders has been built - NGOs and religious leaders play a significant role	- There is still a need for an extensive socialization program of the disaster management from the local government. Although the BPBD has launched the disaster management program along with other government institutions and NGOs, but not all the community aware of it. The information has yet to be known by the smallest group in the community, i.e: the household	- Socialization to the people is done through FPB, television and radio

Table 6. People’s Awareness of Disaster Management Policy of the Local Authority

Padang	Sleman	Cilacap	Palu
People are already aware of evacuation paths, sirens, RABAB, etc	People are quite aware of evacuation action through sirens, especially who lived in the disaster prone areas	There is still a need for socialization of evacuation signs and shelters	People are not aware of any disaster management policy from the local authority
Comparing to government institutions, NGOs (such as Mercy Corps) are more active in providing socialization and education to the people	Government (BPBD) along with the NGOs, academicians, and other stakeholders regularly provides socialization and education	BPBD and PMI actively conduct socialization and education the people. They also involve the people in developing the contingency plan in the event of disaster	Community leaders are the one who initiated coordination with the authority and other organizations. The response from the authority is always late and mostly incorrect.
People tried to find information from BPBD Padang or other media, such as radio	People tried to find information from media, such as radio	After the socialization, the people are more aware of the contingency plan (saving their lives is far more important than saving their assets)	

people in the community are also considered as important factors affecting the resilience of an area.

**Economics aspects**

Based on the economics aspects of the resilience, it can be concluded that in general most of respondents do not

have reserve/ emergency funds in the case of disaster event. This information supported by the fact that more than 85 percent of the household’s income is used in regular basic needs such as foods, clothing and housing. Therefore, when disaster occurred, they heavily relied on the help of debt or selling some of their assets, as well

as used cash in hand as emergency funds. This condition is also reflected by the recovery time after the event. In general, respondents in all sample cities are able to re-start their economic activities as soon as two weeks after the event of disaster.

### ***Institutional aspects***

Results from the survey found that most of respondents were aware that the government has programs to educate people on the disaster mitigation. The information delivered in information program is different among the four observed cities based on the types of previous disaster events. The most common used tools as the early warning system in the four cities are loudspeaker placed scattered in the areas. The survey indicates that the most common places used as temporary shelter are public fields. In addition to those places, open fields and religious center (or place for worship) is also used. Other evacuation shelters that used are the government offices, main roads, neighbors' houses, other family houses, and hospitals. It is shown that on average the distance to the temporary shelters is more than one KM, except for Palu. In addition, people in Yogyakarta are relocated far from their houses since the types of disaster occurred mostly in the form of volcano eruptions.

### ***Infrastructure aspects***

In general, in terms of infrastructure, each of the four cities has different level of preparedness towards natural disasters. However, they share common perception on the infrastructure of the telecommunication system. It reveals that more than 80 percent of

respondents agreed that there were no communication barriers during and after the disaster event.

## **Conclusion**

The purpose of this study is twofold. Firstly to identify factors affecting the resilience toward natural disasters in four disaster prone areas in Indonesia (Cilacap, Padang, Palu, and Sleman), and secondly to compare preparedness and gain insights regarding the household perceptions on the identified factors in those areas.

This study applies qualitative research methods of *in dept interview* (IDI) and *focus group discussion* (FGD) to collect data and information regarding the perception of households in four disaster-prone areas in Indonesia, i.e: Cilacap, Padang, Palu, and Sleman.

Findings from the survey indicate that in terms of social aspects of resilience, the preparedness of the people who live in the disaster-prone areas is significantly affected by community values cohesiveness supported by communication systems provided by the local government as well as the empathy, solidarity and the ability to help among the people. Regarding economics aspect of the resilience, it can be concluded that in general most of respondents do not have reserve/emergency funds and they heavily relied on the help of debt or selling some of their assets to recover after the disaster event. In addition, in terms of institutional aspect of resilience, we find that most of respondents agree that government has programs to educate people, however the participation the average frequency of attending the program only once in the last two year. The lo-

cal governments in four cities have also provided areas, such as schools, open fields and or religious centers as temporary shelters in to relocate people in the event of disaster. Regarding infrastructure aspect of resilience, each city has different level of preparedness towards natural disasters, but majority of respondents agree that there is no communication barrier during and post disaster events. Based on the IDIs and FGDs and preliminary survey results, Cilacap is more prepared

than the other area in terms of financial readiness, which is in accordance with preliminary survey result stating that in all resilience aspects, Cilacap is relatively more prepared compared to other three cities.

Finally, people awareness of the disaster risk largely built by the help of KSB, a semi-formal organization both in Padang and Sleman. This organization includes community leaders, the youths, and religious leaders

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