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The Impact of Major Geological Hazards to Community Resilience in Indonesia

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Abstract

Post-disaster recovery offers opportunities to rebuild safer, more resilient communities in the future. In the past decades Indonesia has experienced some major disasters such as Indian Ocean tsunami (2004), West Sumatera earthquake (2009), Mt. Merapi eruption (2010), and Mt. Sinabung eruption (2010-now). All four are with different characteristics from past disaster frequencies to different emergency period. These different characteristics play a big role in determining post-disaster recovery as a medium for building a more resilient community, which is why reviewing key aspects of disaster resilient communities becomes important in order to learn some lessons in managing future disasters. Method used in this study is descriptive qualitative approach. Information on key elements then classified using tabulation. Data collected from previous literatures, except for Mt. Sinabung which are collected using in-depth interview. This study finds that frequency of previous disasters and emergency period plays a huge role in disaster management, especially in government commitment, and risk management in general. Disasters with shorter emergency period tend to be better at task management from response, recovery and mitigation; while in longer emergency period the three may overlap so much it requires higher expertise in disaster management.

Keywords: *post-disaster recovery, disaster management, disaster, community resilience*

1. Introduction

Indonesia's geographical location as an archipelago located at the juncture of three tectonic plates, namely Indo Australia Plate, Eurasia and the Pacific, consequently potential to cause earthquake when plates collide. Moreover, Indonesia has 129 active volcanoes which 80 of them are active. Ever since 2004 Indian Ocean Tsunami there has been significant increase in geological disasters in Indonesia. Up until September 2016, 1.707 disasters phenomenon are recorded with 411 deaths & missing, 2.214.256 displaced, and 25.578 residential damaged¹. Of all the disasters, there are a few that stands out: earthquakes, tsunamis, and volcano eruptions. These disasters, caused high number of damages and loss in just one event compared to floods and landslides that happened more frequently. 46,2% of economic loss happened because of earthquake, and 26,3% of the combined economic loss is caused by tsunami². 2004 Indian Ocean Tsunami remains as macro disaster with highest death toll reaching 170.000 deaths. 2010 Merapi Eruption is the highest mezzo disaster, it caused 353 death toll and 350.000 people displaced.

Morrow (1999) outlines four types of resources required for Post-disaster recovery (PDR): Economic, Social, Individual and Political. But then again access to resources are always dependent on social

¹ <http://dibi.bnppb.go.id/>, accessed at November 2nd 2016

² <http://www.emdat.be/>, accessed at November 2nd 2016

and economic relations. Rescue/relief becomes crucial in post-disaster recovery; people then earn livelihood through different access in order to “return to normal”. Immediate response is crucial, even though PDR can take years/decades to be fully realized. Levels of implementation are required at National, Provincial, District, Sub-District and Local/ Village stages. At a localized level it needs to be carried out by community leaders, NGOs and International Agencies, eg: UNDP (United Nations Development Program). Resource mobilization are needed in gathering, management and distribution of relief. Alternative funding exploration: Insurance, bi/multi-lateral aid/ trust-fund established for disasters. Recovery period depends on the community’s resilience.

According to Perka BNPB 01/2012, community resilience is a community’s capacity to adapt and minimize the damaging power until they are able to resume their live as normal or at least to restore itself back independently. Norris (2007) describes community resilience as a metaphor which roots in the sciences of physics and mathematics, the term originally was used to describe the capacity of a material or system to return to equilibrium after a displacement. Aguirre (2006) sees resilience as encompassing all three of these components. In an ongoing process, a resilient community predicts and anticipates disasters; absorbs, responds and recovers from the shock; and improvises and innovates in response to disasters.

Twigg (2009) defines community resilience as the capacity to anticipate, minimize and absorb potential stresses or destructive forces through adaptation or resistance; manage or maintain certain basic functions and structures during disastrous events; and recover or ‘bounce back’ after an event. Twigg (2009) defines characteristics of disaster resilient community in to five thematic areas based on Hyogo Framework for Action as follows:

1. **Governance**, includes regulatory system, policy planning, partnership. Twigg described this theme as a ‘cross-cutting’ theme underlying the other thematic areas, and users are advised to refer governance aspects in all thematic areas. In order to really achieve community resilience, the presence of an enabling government and environment is vital. In this paper, there are three key elements are going to be used:
 - a. **Policy**, planning, priorities and political commitment of local and national government in post-disaster recovery.
 - b. **Partnership**, how the government develops partnership and coordination with other institutions such as international and local NGOs.
2. **Risk Assessment**, includes risk assessment in which the community is facing, dissemination of assessment, and ongoing monitoring of hazards, risks and update of assessments. In this paper, there are two key elements are going to be used:
 - a. **Hazard, risk, vulnerability and capacity assessment**, efforts to make an elaborate risk assessment and maps of the exposed area. Mandated by public policy, legislation, assessment done with support by local government.
 - b. **Dissemination of result**, dissemination of the assessment result to the masses in form of seminar, signage, broadcast, etc.
3. **Knowledge and Education**, includes risk perception, information management, cultures, education, and research. In order for a community to become resilient, it has to know beforehand the danger looms before them. Information management becomes vital in perpetuating a shared vision of a resilient community. Any kinds of education & knowledge regarding risks and any training at all is vital as a base in which resilience is built. In this paper, there are four key elements are going to be used:
 - a. **Risk perception**, public awareness of disaster and its risk in their community.

- b. **Information on risk**, information on risk shared to the people, closely related to dissemination of result. Source of risk can come from many, including local wisdom, indigenous knowledge, and traditions.
 - c. **Education on disaster**, local school provide education on DRR through curriculum, training and simulations held, and community experience in coping from previous events.
 - d. **Cultures**, any shared community values, aspiration and goals that may increase community's capacity in recovering from disaster.
4. **Risk Management and Vulnerability Reduction**, includes natural resource management, welfare sustainable livelihoods, social protection, and structural mitigations. In order to build a better community, better resistance must be built at the same time to prevent loss. In this paper, there are five key elements are going to be used:
- a. **Welfare**, health and wellbeing of the people in displaced camps, personal security, access to sufficient clean water and sanitation, recovery of health care facilities.
 - b. **Access to livelihoods**, access to livelihood for the people in displaced camps to fulfill their economic needs.
 - c. **Social protection**, mutual assistance system to support victims. Community access to basic social services, established social information and communication channels.
 - d. **Social political**, social and political climate, conflicts and anything that may affect community's capacity for recovery.
 - e. **Resource management**, environmental and natural resource management, food distribution, clean water management and electricity in displacement camps.
5. **Disaster Preparedness and Response**, includes early warning system, preparedness and contingency planning, emergency response and recovery, and participation. After knowing what risks after them, community needs to prepare themselves to evacuate and bounce back after the disaster. In this paper, there are four key elements are going to be used:
- a. **Early warning system**, community-based and people-centered EWS at local level, EWS provides local detail of events, EWS based on community knowledge, community trust in EWS and organizations providing EWS.
 - b. **Contingency planning**, includes community preparedness and contingency planning, developed and coordinated with official emergency plans and agencies.
 - c. **Emergency response and recovery**, includes humanitarian aid in emergency response phase, safe evacuation routes, emergency shelters, supplies.
 - d. **Participation**, voluntarism and accountability. Community's response on simulations, training, and overall efforts in post-disaster recovery.

In the end, all five themes are related one to another. This study aims to see the existence of these five key elements in post-disaster recovery up until now, reviews how each themes are handled in different post-disaster recovery efforts and see how the themes affects community resilience in general. Different types of disaster have different period, thus different way in handling it.

2. Methods

In order to gather data and information on post disaster recovery, authors refer to scientific papers and articles that can be downloaded from the internet. Literatures were downloaded from websites such as science direct and university website.

In Indonesia, earthquake, tsunami and volcano eruptions remains as the leading types of disaster which caused highest death tolls and displacement. However, tsunami & earthquake's disaster

recovery period will differ with volcanic eruptions which could happen for months to come. Data collected are related to major disaster incident happened in Indonesia ever since 2004, they are: 2004 Indian Ocean Tsunami, 2009 West Sumatera Earthquake, 2010 Mt. Merapi Eruption, and 2010-now Mt. Sinabung Eruption. To analyze the data, this study uses descriptive qualitative approach. Data collected from previous literatures, except for Mt. Sinabung which are collected using in-depth interview. Then, all of the information are synthesized by tabulation and matrix classification.

3. Major Geological Disasters in Indonesia

1.1 2004 Indian Ocean Tsunami

On Sunday December 26th at 0058 UTC (0758 local at the epicenter), a great earthquake occurred 250 km southwest of Banda Aceh in northern Sumatra, Indonesia. With a moment magnitude of 9.3, it was the second largest instrumentally recorded earthquake in history (Stein and Okal, 2005). As of July 2005, official figures put the number of dead, missing and displaced in the Indian Ocean region at more than 175,000, nearly 50,000 and over 1.7 million, respectively. Indonesia's Aceh province, closest to the epicenter of the earthquake, was exceptionally hard hit. According to the Indonesian government's disaster coordinating agency, BAKORNAS, by the end of March 2005, 128,645 people in Aceh had lost their lives, 37,063 were missing and 532,898 had been displaced (USAID, 2005)

1.2 2009 West Sumatera Earthquake

On Wednesday, 30 September 2009, an earthquake occurred with magnitude 7.6, epicenter 45 km WNW of Padang. 1,115 people were killed (60 per cent of them in Padang-Pariaman District), 1,214 were seriously injured and 1,688 were lightly wounded. Of 379,200 buildings that were damaged (three quarters of which were houses). Around 135,000 houses were severely damaged and an estimated 1,250,000 were made homeless or otherwise severely affected (Grundy, 2010). Since this earthquake did not result in a tsunami the vulnerability to a tsunami has not been tested.

1.3 2010 Mt. Merapi Eruption

On 2010 Mt. Merapi erupted, and it is known as '100' year's event which brought devastating disaster for the community who lives around its flanks. It generated tephra plume that reached 12 km altitude, released SO₂ emissions larger than any of its recorded eruptions (from 1992 to 2007), resulted more than 280 lahar events along 13 rivers, and produced pyroclastic density flow currents that cruised 8 km down the Kali Gendol River and Kali Kuning River drainages channel on the south flank of the volcano (Surono et al., 2012). 367 people were killed, 400,000 people were evacuated, and 2,300 houses were collapsed. The volcanic hazards also ruined infrastructures (such as dams, bridges, roads, etc.). The eruption ruined community's economic assets and source of livelihood such as farmland, irrigation, water storage, and livestock.

1.4 2010 & 2013-now Mt. Sinabung Eruption

Mt. Sinabung is unique, its eruption at 2010 was the first one after lying dormant for 400 years and is now Indonesia's most active volcano. Then the volcano erupted again at 2013 and hasn't stopped ever since. The uncertainty caused by long eruption of Mt. Sinabung for more than five years has caused as many as 2,592 families and 9,319 people displaced³. Some villages have been relocated to a safer place, but some are still in constant brink of uncertainty, unable to return home yet unknowing of where to go next.

³ Mt. Sinabung Media Center, May 23rd 2016

4. Community Resilience Aspects in PDR

1.5 Governance

1.5.1 2004 Aceh Tsunami

When 2004 tsunami happened, there were no agency in disaster management, and local government has collapsed. Since local government administration collapsed and central government had limited capacity in the operational ground, NGOs become the “real” actor who drove emergency aid, rehabilitation and reconstruction (Steinberg, 2007). Then Government of Indonesia (GoI) appointed Bappenas to develop a master plan in rehabilitation and reconstruction (Jayasuriya, et al. 2010). However, many NGOs and Aceh local government refused the master plan’s idea. They are worried by establishing a new agency could add new layer of bureaucracy to the problems of working in Aceh, since all of the construction work would be tendered in Jakarta, capital city of Indonesia, without proper local needs and involvement (Jayasuriya, et al. 2010). But still, at May 2005 BRR (Rehabilitation and Reconstruction Agency) was established by cabinet decision to coordinate agencies and donors in reconstruction work (Steinberg, 2007).

The existing conflict dynamics between GoI and Free Aceh Movement (GAM) added an extra element of obstacle in devising partnerships and organizing cooperation between groups. According to Bauman et al (2006), partnership was not as smooth as it could be between NGOs and INGOs since they lacked in cohesive process. That happened largely due to many NGOs not having awareness of the inherent tensions and problems of the conflict. However, partnership in mitigation for future disasters has been evident in the development of groups such as NTHMP, IOTWS, and other inter-governmental bodies.

1.5.2 2009 West Sumatera Earthquake

There are 142 activities invested in disaster recovery. Government contributed the more than 80% of them to coordination, planning, strengthening institutions and legislations (Sagala, 2010). Compared to Merapi, this number of activities is significantly higher, considering West Sumatera has fewer people than the people affected by Merapi, the reason why is because the NGOs. NGOs invested much more in earthquake and tsunami related education and awareness activities in West Sumatera. This may have happened due to the residual effect of tsunami responses on the Western Coast of Sumatra. This number of activities does not result in all people are catered, there are places who doesn’t receive aid such as the China Town, this will be discussed further in Social and Political context. NGO Project Manager in Padang said that the institution with which she worked was never invited by the government to discuss recovery planning, design, implementation or evaluation (Alfirdaus, 2014).

Many people found temporary accommodation with relatives and members of their extended families. Mainly by means of international donations, 13,778 temporary dwellings were constructed (Alexander, 2012). Recovery in West Sumatera took place in November 2009, 2 months after the disaster. The UN Cluster approach was applied in the ground and some NGOs took on respective responsibilities for aid based on the coordination guidelines and the Sphere Standards. The funding for the West Sumatra Earthquake Recovery was received from four sources: Foreign Grant, National Budget, Provincial Budget and District/Municipality Budget (Bappenas, 2009).

1.5.3 2010 Mt. Merapi Eruption

There are 123 activities invested in disaster recovery. Government contributed the more than 80% to coordination, planning, strengthening institutions and legislations, similar as the one in West Sumatera (Sagala, 2010). The problem in this case is lack of coordination, which then led to confusion

and made it difficult to take decisions that are needed is mainly felt by community leaders. There are lack of coordination between the village and district levels, especially in evacuation. This situation consequently influences the evacuation process as villager become scattered and separated from family or other community members (Christia & Helleve, 2012).

Emergency plan issued by the local government depends to a large extent on CSO and CR with a growing involvement of NGOs and private organizations. However, orders to the public such as evacuation orders are given by BNPB and local governments, which also organize evacuations (Bakkour, et al., 2013). At 1994 Merapi also erupted, and there was unanimity in their opposition to resettlement (Dove, 2008), many villagers saw the government resettlement program as just another sort of hazard, and they preferred the hazard that they knew to the one that they didn't (Schlehe, 1996). Now even though people are reluctant in relocating, they are willing to proceed and cooperate with the local government on their relocation (Christia & Helleve, 2012).

1.5.4 2010-now Mt. Sinabung Eruption

A development in 2015 had the national government donate IDR 6 billion to aid efforts, although a lack of local government transparency has led to a drop in governmental trust among local residents. Partnership was present through The UN World Food Program assisting local authorities; some aspects of relief included setting up a logistics hub, providing technical operational support, implementing training and coaching programs for BPND, BPBD north Sumatra and BPBD Karo district.

1.6 Risk Assessment

1.6.1 2004 Aceh Tsunami

Risk Assessment has had the most effectiveness when risks are transmitted by sources people trust and consider credible. In the case of procedural changes to Tsunami warnings; RTSP's are disseminated through text formats which are generated into bulletins which are generated into warnings on the associated websites. From this a number of indicators are generated which give key facts about the size, severity, elapsed time since earthquake etc., which are helpful in assessing likely outcomes of the tsunami (Shaw, 2015).

1.6.2 2009 West Sumatera Earthquake

Before the earthquake happened, there were minor earthquakes struck West Sumatera, people couldn't really predict which area will be most damaged. Risk assessment were not done right after, but a contingency plan, risk assessment, and disaster risk management was done in collaboration with NGOs and universities. 2010 Mt. Merapi Eruption

PVMBG and the local government has made a risk assessment of Merapi. There are also many studies on Merapi and its hazard zone. The cultural significance of Merapi means the community is reliant on modes of transmission of knowledge which may not be effective, categorized as either external or internal. External being teachers, journalists or local authorities; and internal being local elders, usually more likely to have witnessed or experienced an eruption. Yet methods of risk and hazard conveyance are insufficient in communicating the consequences of a real eruption (Lavigne et al, 2008).

1.6.3 2010-now Mt. Sinabung Eruption

Some academics (Chatfield & Reddick, 2015) assert that some of the deaths at Sinabung were avoidable, (the students), that lack of activity on twitter on the government's behalf made the effects of the eruption worse. Essentially, there was a "*facilitated or inhibited communication of risk*

perception by the government". The hazard assessment is done by PVMBG, yet the content was not suitable for public use due to it being too technical; instead it was directed more for BPNN (National Disaster Management Agency), whom then disseminates information via twitter feed.

This shows a traditional top down disaster-risk communication, not multi-directional. Hence the government 'bureaucratic efficacy' has come under scrutiny, and inter-agency communication must be improved to further enhance communication lines: '*which seems to contain competing and contradictory disaster risk perceptions, policies and government actions*'.

1.7 Knowledge and Education

1.7.1 2004 Aceh Tsunami

According to Keumala (2014), 85% of the people living on the coast are aware of their unsafe location, the rest who answered they are safe are aware of the risk too but they 89% of them answered they believe so without reason. This percentage shows an adequate level of risk perception, supported with signage and evacuation route. In terms of Education, post-disaster risk process was implemented largely through Hyogo Framework for Action (HFA), which was adopted in 2005. There is greater demand for education in risk reduction, with specific targets set along with measurements of progress, Sekolah Siaga Bencana (SSB) or Disaster Preparedness School activity was implemented and disaster education is made in the curriculum since 2012.

The Cultural profile of Indonesia does lend itself to a great deal of risk education through myths and legends, however in the 2004 case this was only evident in minor cultures such as the Simeulue, whose tsunami awareness was a cultural property shared by their ancestors. The people of Aceh, having no recent experience with major disaster not of a conflictual nature.

1.7.2 2009 West Sumatera Earthquake

Disaster management education in Padang has become exemplary, especially with the mix use of school as tsunami evacuation shelter raises the awareness of students and teachers, which is good since children could become a medium of information for their families. West Sumatera has some cultures that may contribute to social capital such as (1) capital sharing, (2) *gotong royong*, and (3) *perantauan* (Vanhoebrouck & Sagala, 2010). Capital sharing means that much of the material and social resources necessary for an appropriate development contributing to the wealth and health of a community will be shared through fixed socialization processes. Gotong royong, it's a culture where people help each other out due to pure altruistic reasons, it can be shown in Pau Limau where people do infrastructure repair and construction together. *Perantauan*, on the other hand is when a man comes of age and migrate to other place, the migrant distribution then comes to help migrants' families who were victims of the disaster.

1.7.3 2010 Mt. Merapi Eruption

One interesting social factor is noted: "emphasized the role of non-hazard related socio-economic factors in shaping people's behavior in case of an ongoing eruption. "e.g. women less likely to have hazard knowledge because of less time (or no time) on volcano, but as such would be more likely to evacuate quickly. This condition points out to a community's lack of information dissemination amongst its own people, causing a risk perception gap.

The cultural knowledge within the community is fairly extensive, and as such the risk perception and education is informed heavily by this factor (Wimbardana and Sagala, 2013). Myths about Merapi are

handed down from generation to generation, also creating a sort of ‘culture of hazard’ which can numb people to the actuality of the dangers (Dove, 2008). As such, local communities even experience a ‘positive’ reaction to disaster; such as improved religiosity and a stronger sense of togetherness. Dissemination of myths about Volcanoes and the traditional (Javanese) interpretation of power existent within Java is an important part of Javanese cultural heritage. The interpretation of Merapi as a figure of creation, and a place of spirituality can show us both the importance to villagers but also outline how the hazards are perhaps disseminated in a mystical sense which desensitizes the populace to the dangers.

1.7.4 2010-now Mt. Sinabung Eruption

The existing risk perception inherent culturally is not as strong as with their Javanese counterparts. This is perhaps due to the great length of time Sinabung has been dormant, and the lack of major Volcanic activity in recent times in the northern Sumatra region. As such there was also less information of risk leading up to the Sinabung eruption. In terms of Information on disaster, effective use of social media shows that more interaction is required from the public, more engagement means greater awareness in both the public sphere and at a government level.

Ever since the people are displaced, perception of risk has lowered. People still goes to the hazard zone to farm and fulfill their daily needs.⁴ Warnings has been assigned and militaries are posted to search for any remaining villagers within the danger zone but people has strong attachment to their land; in other words, their culture might actually hold them back from relocating to safer place.⁵

1.8 Risk Management and Vulnerability Reduction

1.8.1 2004 Aceh Tsunami

Welfare becomes a complex aspect in Aceh since there are restriction for humanitarian access to areas known as GAM strongholds – or “black areas” – was reportedly extremely poor (AI, 20 January 2005, p. 2). Aceh-based women groups say the misery of the surviving females continued in the camps for the half a million survivors who have lost their homes. Head of the Aceh Gender Transformation Working Group confessed that harassment against women usually come when they have to go to the bathrooms. Most bathrooms in camps for the displaced are not segregated by sex and many young male survivors like to hang out near those places to kill time (Reuters, 26 March 2005). During the current military operations, a few allegations of crimes of sexual violence by the military have been investigated. Despite repeated allegations of crimes of violence against women by the security forces during previous military operations, only one case is known to have been investigated, and no one is known to have been brought to justice (AI, 8 December 2004).

In terms of social protection, many NGOs implemented Cash for Work program in Aceh. One of which is Mercy Corps. Mercy Corps’ CFW program in Aceh was a complementary intervention to provide food relief and it allowed participants to supplement rations while facilitating savings and asset purchase. On the other side, it increased purchasing power which enabled households to meet basic needs. CFW contributed significantly to household economic recovery and was a factor in aiding the return of displaced population members to their original communities of residence (Doocy, et al., 2006).

⁴ Interview with local activist at May 10th 2016, PVMBG at May 11th 2016 and Beidar at May 23rd 2016

⁵ Interview with local anthropologist at May 16th 2016

The government provided barracks for tsunami IDPs. There are also some portions of the IDPs that aren't moved into barracks due to the barracks' limited capacity. This condition pressures the cohesiveness of local social structure. Suspicions and distrust among one another started to take place and increased as some village figures compete for influence (Mahdi, 2007).

The social political scope in Aceh is added due to Aceh's history with conflict and the presence of the GAM (Gerakan Aceh Merdeka, or Free Aceh Movement), whose tension with the GoI (Government of Indonesia) has been a constant conflict since 1976. These hostilities were set aside in the aftermath of 2004's disaster, and a temporary ceasefire (a Memorandum of Understanding/ MoU) was agreed upon, as the GoI also relaxed restrictions upon northern Sumatra. The intervention of the international community was also a factor in creating a push and pull factor that engaged the parties in the peace process (Bauman et al, 2006).

1.8.2 2009 West Sumatera Earthquake

Problems surrounding the IDP camps at the time revolves around hygiene and sanitation which is a common theme. OXFAM rallied a gender-sensitive advocacy, they designed two different hygiene kits especially for women as part of the water, sanitation and hygiene (WASH) emergency activities inspired by a local woman named Ibu Darmulis. Pregnant women received a kit specifically designed to meet their needs, as well as extra supplies for the delivery, soap and clothes for the baby, and a kitchen set. (Oxfam, 2012)

Many of the victims receives aid and help from their relatives who migrate to other land (Vanhoebrouck, & Sagala, 2010). A lot of female-headed households were created by male migration but even where men were present, feedback from the community suggested that, in most cases, women managed cash transfer payments and men and women discussed together how to use the cash.

1.8.3 2010 Mt. Merapi Eruption

Risks associated with volcanic risk can't really be disentangled from socio-economic and cultural context. However, the disaster management frameworks rarely reflect this fact. Major factors often overlooked are religion and access to livelihoods. Also risk comparison: e.g daily food security and poverty issues vs the rare (but destructive) threat of volcanic activity.

After a disaster there is often a disturbance in the flow of production, services, infrastructure etc, unemployment will increase but how to repair this social infrastructure? There is a myriad of strategies, but all depend on "*capability of individuals, households, groups and institutions to utilize and access existing resources*" (Pratama, et al, 2013)

Food security major priority in terms of hazard perception, due to population being very poor (Lavigne et al, 2008). Right after the end of emergency phase, the government of Indonesia helped the victims by "buying" their dead livestock, especially cattle. This policy was aimed to enhance household economic recovery after the devastating disaster. Instead of using the cash for restoring their livelihood resources, the beneficiary tend to use it as saving to meet basic need during living in emergency shelter, such as food, clothes, children's education needs, and rebuilding their dwelling (Wimbardana & Sagala, 2013).

The limited amount of adequate infrastructure and high prices for cattle breeding and treatment after the eruption became an apparent obstacle to restore community livelihood. Thus some of the funds

that were sent and received as aid was used by the villagers in temporary settlements to meet every day needs and also as savings to use as financial capital to explore more or restore their sources of income. Even though in practice this strategy could support the disaster victims to stay alive in times of crisis, it could not provide ample opportunity for the communities to access and utilize resources sustainably. (Sagala, et al., 2014)

Wahyuwijayanti (2012) found that community participation amongst members of the Umbulharjo Village, Cangkringan District, was quite strong. However, the government as yet was not supporting them in their endeavours. The research found that leadership, social network, and community participation were important factors in the process of self-help recovery. This is conducted by the community itself. The self-help recovery takes the form of economic recovery and house reconstruction, while the fundraising is done through the tourism activity in Volcano Tour areas, which is also set up by local communities. This is an effective rebuilding of access to livelihood, however there is an issue with unsustainability of tourism due to Volcano tourism often being classed as ‘dark tourism’.

1.8.4 2010-now Mt. Sinabung Eruption

Livelihood is a problem in Mt. Sinabung eruption PDR. Farming is part of Karo culture, farming becomes a pride for the people. Majority of the Sinabung victims are farmers, Mt. Sinabung eruption caused many loss of agricultural assets such as land, irrigation and livestock. Having little option to fulfill their livelihood, the IDPs are forced to return to their land within the hazard zone to farm. The farming culture has become so deep and ingrained that any trainings given by the UN for alternate source of income was fallen down. These people return to farming even though they have already given some training to work as something else such as tailoring and woodwork.⁶

Lack of fertile land and unequal distribution of seeds has also heightened the tensions between IDPs in Siosar. This tension then sours the relationship between IDPs and the government even more. Problems such as looting and conflicts between IDPs and local community also existed in a certain camp where an IDP was alleged with rape towards a local resident, racial conflicts between Nias tribe and Karo tribe also existed which threatened the security of not only IDPs but also community.⁷

Another central issue surrounding IDPs in Sinabung is the uncertainty that lingers regarding repatriation and relocation. The continuous emergency status of Mt. Sinabung, makes the local government reluctant to some of the IDPs. The uncertainty drives a growing distrust between the IDPs and the governments, making some of the IDPs choose to return to their origin villages rather than staying in the IDP camps.⁸ Another problem rose from dissent between future host community in Lingga village who refused to host IDPs unless the IDPs integrates as Lingga villagers. A riot broke out at 29th July 2016, resulting in death of one civilian.

1.9 Disaster Preparedness and Response

1.9.1 2004 Aceh Tsunami

As with the ‘earthquake-tsunami association’ not being present, the local mechanisms for disaster response were virtually non-existent. In terms of the early warning system also not being present, some tribal knowledge had been passed down to the people of Simeulue, where the tell-tale signs of

⁶ Interview with FAO at May 4th 2016

⁷ Interview with local anthropologist at May 16th 2016

⁸ Interview with local activist at May 10th 2016

receding water and earth shaking alerted the locals to danger of tsunami (Levy & Gopalakrishnan, 2005). In the years since 2004, a rapid acceleration has occurred in the development of the Indian Ocean Warning System, (IOTWS). The Intergovernmental cooperation has also increased, with National Tsunami Warning Centre's (NTWC) of individual countries choosing the Regional Tsunami Advisory Service Providers (RTSP's) from which they wish to access tsunami watch information from. This updating of systems means all tsunami watch information must be interoperable between countries, however; "tsunami warning system can only be successful if it spans the continuum of activities associated with an "end-to-end" approach. An end-to-end tsunami warning system begins with the rapid detection of a tsunami wave and ends with a well prepared community that is capable of responding appropriately to a warning." (Shaw, 2015). Contingency planning runs along the same lines as emergency response. The unheralded nature of the 2004 tsunami was a significant learning curve for the people of Aceh and all the governing bodies involved. Disaster preparedness and planning was virtually non-existent.

Humanitarian aid for the 2004 tsunami was significant across the international spectrum. Major international states and non-state actors were strong in their presence both on the ground and in-terms of funding support. Some critics noted that recipients of aid were passive in the process, as the participation of the affected people in the planning, design, and implementation of relief and reconstruction processes has been very low (Bauman et al, 2006). This results in a lack of sense of ownership in the process by the beneficiaries. An examination of funding sees that a total of US\$ 14 billion was donated to the Tsunami relief, with 46 % came from governments, 39 % from private and 15 % from multilateral. The largest bilateral donors were Australia, Japan, United States, Germany and EU, as their funding amounted to 60 % of support from foreign governments. Indonesia received p34.4% of this funding, with the next most going to Sri Lanka, who received 25%.

In 2012, however, another tsunami happened in Aceh. Even though tsunami evacuation shelters are built, many of the people refused to utilize it. According to Keumala (2014), the community doesn't know the function, they don't trust the shelter's reliability in evacuation, and there is no sense of ownership towards the shelter which leads to neglect.

1.9.2 2009 West Sumatera Earthquake

One of initiators for disaster preparedness in West Sumatera is Kogami (Komunitas Siaga Tsunami) or Tsunami Alert Community. As prior to 2009 West Sumatera Earthquake, Birkmann et al (2008) noted that almost 100% of the respondents in their research are familiar with the word "Tsunami". Even though most of them have never experienced tsunami personally. 86% answered the correct definition of tsunami This shows a good level of risk perception within the community on geological hazards. This was particularly due to remembrance of Indian Ocean Tsunami 2004 occurred in Sumatera, where Padang is located.

1.9.3 2010 Mt. Merapi Eruption

A community-based NGO named Jalin Merapi has a role on relaying early warning system. They sent messages, tweet, and broadcast any information on volcanic activities through radio. They spread the information quickly and act as a gateway to the community. Their use of radio broadcast is effective since people who lives there mostly listen to the radio. (Tanesia & Habibi, 2010).

Humanitarian aid was significant from the international community, including 1.5 million EU\$ from the EU council, 2 Million US\$ from the US government and 1 Million AU\$ from the Australian government. The Indonesian Red Cross and Red Crescent worked hard in this situation providing meals for displaced villagers and other acts of aid. Partnership again was evident with SAR (search and rescue) teams working in tandem with Army special forces (KOPASSUS) teams in searching for missing villagers.

When lahar disasters occur, relief is usually provided by a wide variety of institutions, namely: District (30%), Local institutions (villages) (22%), Sub-district (16%), Province (10%), Private companies (10%), Central government (6%) and International institutions (6%). Other stakeholders involved during the state of emergency (level III and IV) are volcanologists (PVMBG), local disaster management agency (BPBD) including army, police, health department, public work department, social department. The people argues institutions that should first react when lahar occurs are mainly: neighbors, local authorities (village chief, rescue team, personalities), sub-district authorities and regency. This indicates a participatory approach that is facilitated by strong social networks and bottom up relationships. (Bakkour, et al., 2013)

1.9.4 2010-now Mt. Sinabung Eruption

Since none of the people know Mt. Sinabung aren't even dormant, community preparedness is low. Local government made no preparation or training whatsoever in facing the eruption, no contingency planning is made until now, all actions are done as responsive which then lead to other problems. On May 2016, cold lahar erupted it killed two children, injured three people and damaged three houses; this happened due to the local government's negligence on mitigating hazards. Cold lahars are accumulated and caused shallowing of river which then caused cold lahar to overflow and hooped unexpected locations.⁹

Local NGO called Beidar—in cooperation with PVMBG (Center for Volcanology and Geological Hazard Mitigation) volcano monitoring station—is responsible of disseminating any activity and maintain people's activities outside danger zone. Up until now there are no established early warning system in Mt. Sinabung. Early warning is done from mouth to mouth by Beidar agents to local communities located at the edge of danger zone.¹⁰

In 2014, humanitarian aid in terms of Sinabung eruption has consisted of US government aid provided through United States Office of Foreign Disaster Assistance (OFDA), and significant contributions from National bodies, as well as the Indonesian Red Cross, who has been operating in the area since 2010. Significantly, Red Cross received a donation of IDR 2.5 billion (around USD 188,000) from Krama Yudha Mitsubishi Group to aid relief efforts in Sinabung (Red Cross, 2015).

In constructing IDP relocation area at Siosar, construction process was done by the military. IDPs were not given part on building their homes, only to choose their new houses through lottery tickets.¹¹ This happened due to deadline given by the President, at the time utilizing military to build these homes was seen as a faster, effective way.

⁹ Interview with local activist at May 10th 2016

¹⁰ Interview with PVMBG at May 11th 2016 and Beidar at May 23rd 2016

¹¹ Interview with IDPs on Siosar at May 16th 2016

5. Discussion

This study attempts to examine processes and lessons learned from five disaster-resilient community's characteristics exist in four major disaster events in Indonesia. Data are limited to the information provided in the literatures.

1.10 Governance

		2004 Indian Ocean Tsunami	2009 West Sumatera Earthquake	2010 Mt Merapi Eruption	2011-now Mt Sinabung Eruption
Governance	Policy				
	Partnership				

Between the four events, it could be concluded that all local government except Merapi are not prepared in dealing with the disasters. Especially Aceh and Karo in dealing with Indian Ocean tsunami and Mt. Sinabung eruption, since there is no prior knowledge whatsoever about the disaster. Even though the local government on both cases are less prepared in handling these disasters, the national government stepped up to overcompensate this problem; in both cases the national government has shown a high level of commitment in managing the disaster. In West Sumatera and Mt. Merapi cases, local governments have shown higher commitment in post-disaster recovery, in West Sumatera is shown by its rigorous effort in improving tsunami early warning system and supporting infrastructures. Both Government contributed the more than 80% to coordination, planning, strengthening institutions and legislations.

In Aceh case, however, the real actor in delivering aid, rehabilitation and reconstruction, are the NGOs; bureaucratic red tapes given by the government and existing conflict between national government and Free Aceh Movement added extra layer of obstacle in partnership, limiting NGOs reach in delivering aid. NGOs are more invested in West Sumatera recovery rather than Mt. Merapi, due to residual effect of the Indian Ocean tsunami. However, according to NGO Project Manager in Padang, they were never invited by the government to discuss recovery planning, indicating lack of coordination and communication in their partnership. In Merapi eruption, emergency plan was issued to a large extent from private organization, but they are lacking in coordination to village level especially in evacuation. In Mt. Sinabung case, a development in 2015 had the national government donate IDR 6 billion to aid efforts, although a lack of local government transparency has led to a drop in governmental trust among local residents.

1.11 Risk Assessment

		2004 Indian Ocean Tsunami	2009 West Sumatera Earthquake	2010 Mt Merapi Eruption	2011-now Mt Sinabung Eruption
Risk Assessment	Hazard/risk assessment				
	Dissemination of result				

Risk assessment are done well in four cases. In case of Indian Ocean Tsunami and Mt. Sinabung eruption it is done after the disaster struck as an effort to prevent more loss in the future. In West Sumatera and Mt. Merapi cases both risk assessment is done since the people already have a knowledge from past disasters, which suggested more preparedness within the people.

Dissemination of risk information are done well in Indian Ocean tsunami and West Sumatera earthquake since both disasters' period are shorter than Mt. Merapi and Mt. Sinabung. Risk dissemination in case of volcano eruption, where disaster happens in longer period, people need to multitask between watching their backs from the looming hazard and disseminating information. In four cases however, dissemination of risk information is done via traditional top down disaster-risk communication.

1.12 Knowledge and Education

		2004 Indian Ocean Tsunami	2009 West Sumatera Earthquake	2010 Mt Merapi Eruption	2011-now Mt Sinabung Eruption
Knowledge and Education	Risk perception	Green	Yellow	Green	Orange
	Information on risk	Yellow	Yellow	Green	Yellow
	Education on disaster	Orange	Green	Green	Orange
	Cultures	Yellow	Green	Green	Orange

After the disaster struck, risk perception of the people changes. In case of Indian Ocean tsunami, people becomes very aware of the risk in their community from the intensity of disaster back in 2004. In Mt. Merapi case, people are very aware of the risk in their community for a different reason that is the frequency of disaster, people are adapting with the frequent Mt. Merapi eruption. However, in Mt. Sinabung case, even with the frequent eruption and long period of disaster status, people are becoming tired of having to keep up their guards at all time and developed a normalcy bias, some of the displaced are even ignoring the government warning to stay out of hazard zone due to lack of access towards livelihood and economic pressure. In terms of risk information and disaster education, West Sumatera becomes an exemplary for other area in Indonesia, disaster education has been inserted within formal education curriculum. Tsunami drills, and trainings have been done periodically. People surrounding Mt. Merapi has extensive knowledge on the risk due to the cultural knowledge within the community. Meanwhile, community surrounding Mt. Sinabung's inherent risk perception and knowledge on disaster isn't as strong as its Javanese counterparts, due to the great length of time Sinabung has been dormant, and the lack of major Volcanic activity in recent times in the northern Sumatra region.

Culturally, each location has their own characteristics affecting their capacity towards disaster. In Indian Ocean tsunami case, a small island, Simeulue, whose tsunami awareness was a cultural property shared by their ancestors, while people of Aceh, having no recent experience with major disaster not of a conflictual nature. In West Sumatera, the problem is quite a significant portion of people have a fatalistic view on disaster, seeing disaster as 'a punishment from God', not as a natural phenomenon that could be avoided; but otherwise West Sumatera cultures like '*merantau*' could actually help disaster victims get back on their feet with help of their relatives across. Disaster-related culture of community near Merapi is fairly extensive, and as such the risk perception and education is informed heavily by this factor, myths are handed down from generation to generation which improved their sense of togetherness and preparedness. Yet in Sinabung case, people's attachment to land and culture may put them in a more vulnerable position since returning to the land they are attached to can actually kill them.

1.13 Risk Management & Vulnerability Reduction

		2004 Indian Ocean Tsunami	2009 West Sumatera Earthquake	2010 Mt Merapi Eruption	2011-now Mt Sinabung Eruption
Risk Management & Vulnerability Reduction	Welfare	Orange	Orange	Yellow	Yellow
	Access to livelihoods	Green	White	Yellow	Orange
	Social protection	Green	Yellow	Green	Orange
	Social Political	Orange	White	Yellow	Orange
	Resource management	Yellow	Orange	Yellow	Yellow

Due to the underlying conflict between GoI and GAM, welfare became a complex issue in post-tsunami Aceh, there were restriction for humanitarian access. There were issues of sexual harassment towards women in IDP camps, there were allegation of crimes towards military personnel stationed in context of GoI-GAM conflict, only one case is investigated but no one is known to have been brought to justice. In post-earthquake Padang, however, a gender-sensitive advocacy was in place rallied by OXFAM in term of women sanitation and needs. Welfare problems after Mt. Merapi and Mt. Sinabung eruptions are related to sanitation and hygiene.

There were efforts in intervening via social protection policies in Indian Ocean tsunami and Mt. Merapi cases. Mercy Corps had implemented a Cash for Work program in Aceh, it was to provide food relief and it allowed participants to supplement rations while facilitating savings and asset purchase; it increased purchasing power of enabled houses. In Mt. Merapi, intervention came from the government, where the government would “buy” their dead livestock; instead of using cash, this is seen as an alternative for household to use as saving to meet basic needs during their time living in emergency shelter. Mt. Sinabung case, however, there were no sustainable intervention efforts in getting household economy back on their feet; trainings were given in order to give IDPs alternate livelihood options but it ended up being unused due to Karo culture’s attachment to land and farming.

Conflicts manifested themselves in all cases except Mt. Merapi 2010 eruption case, whether it lands as a background social-political problem, or tensions between government and IDPs. Aceh’s history with conflict and insurgencies by GAM were set aside by a ceasefire agreement, however in the days following the tsunami, military refused to scale down its counter-insurgency operations, military presence has created many problems and feelings of threat even in camps towards women. In Mt. Sinabung community, the problem risen from long emergency period, people have been living in camps for too long they started to question the government’s competency, lack of information and transparency driven the IDPs to distrust the government even more to a point they refuse to cooperate. Other than the tension between Karo government and IDPs, a riot broke between Lingga villagers and local police, they have refused to host IDPs in their village.

1.14 Disaster Preparedness & Response

After the devastation that is 2004 Indian Ocean tsunami, Indonesia stepped up their game on disaster management, especially in early warning system. Aceh and West Sumatera both have developed their own tsunami early warning system and evacuation infrastructures. Although, on 2012 Aceh tsunami evacuation shelters were not used due to lack of confidence in the structure’s strength. Both tsunami early warning system uses a traditional top down system where local government would wait for

national government's confirmation to issue a tsunami warning throughout the city using sirens, radio, loudspeakers, even text messages. However early warning system in both Mt. Merapi and Mt. Sinabung are quite different, any activities are received from local volcano observation station and issued to the people by a local community-based organization namely Jalin Merapi and Beidar. Both organizations are widely spread in the community and have gained significant amount of trusts from the community.

		2004 Indian Ocean Tsunami	2009 West Sumatera Earthquake	2010 Mt Merapi Eruption	2011-now Mt Sinabung Eruption
Disaster Preparedness and Response	Early warning system	Yellow	Green	Green	Green
	Contingency planning	Yellow	Green	Green	Orange
	Emergency Response & Recovery	Green	Green	Green	Green
	Participation	Yellow	Yellow	Green	Yellow

Among all the cases, only Mt. Sinabung community that hasn't done any sorts of contingency planning, in fact two lives are gone due to the local government negligence on disaster mitigation. However, it is understandable, since until now the volcano is still active and the government has their hand full of emergency response and efforts on relocating the IDPs, giving them little chance to focus on making a contingency plan. Emergency response and recovery in all cases have been done relatively extensive, international community has thrown their hats on helping these cases. In term of participation, Mt. Merapi recovery has shown a strong social network and bottom up relationships from the involvement of sub-district authorities to village head and personalities. In Mt. Sinabung case, an interesting part of the recovery process is that it is issued by the President, and he demanded a speedy recovery, which then he issued the military to build a new relocation place without involving the IDPs.

6. Conclusions

This paper has been able to link the relations between different disaster events with how community resilience develops. Adapted from Twigg's community resilience concept, the conclusion is presented as follows.

Risk assessment characteristics are shown in four cases. Government has invested a high attention on risk assessment and mapping, but in a disaster with longer period such as volcanic eruption, information dissemination is lower, possibly due to local government's attention has been divided on emergency response and evacuation.

Knowledge and education aspect varied among the cases. Mt. Merapi has shown a great amount of commitment regarding disaster education, preparedness and dissemination of risk information; supported by myths passed from generation to generation communities surrounding Mt. Merapi has cultivated higher level of preparedness and risk perception than the other three. Its counterparts, Mt. Sinabung, are not as adept, due to the suddenness of eruption and lack of local wisdom regarding the mountain's activity, the community practically has limited preparedness against volcanic eruption.

West Sumatera, on the other hand is regarded as an exemplar of disaster education, even exceeded Aceh—the one who has experienced tsunami first hand—in other words, West Sumatera has learned its lessons better from 2004 Indian Ocean tsunami and 2009 earthquake.

Risk management and vulnerability reduction has always been the biggest challenge in disaster recovery. 2004 Indian Ocean tsunami and 2009 West Sumatera earthquake has shown almost similar characteristics, where both handles welfare badly—related to the poor social political conflict in the background. Conflicts of the two cases are different, conflict in Aceh has long exists and manifested itself in broad daylight—the disaster actually gave an opportunity for the conflict to cease—meanwhile the conflict in West Sumatera is a racial conflict that has been ingrained in hushed whispers, and still exists until now—which the disaster actually gives a platform for the racial discrimination to be seen more clearly, creating more problems in disaster management. Mt. Sinabung risk management and vulnerability reduction scores the lowest, due to the long period of emergency status problems started to manifest themselves from within the displaced communities and towards it; the uncertainty whether they are able to go home or not is driving the people mad, people starting to doubt the government which lead to growing tensions between the community and the government. However, its counterpart—Mt. Merapi—is better at risk management, due to its adaptiveness towards disaster and the shorter emergency status than Mt. Sinabung.

Disaster preparedness and response is excellent in Mt. Merapi, being so close with disaster all the time—unlike the other three—has made community surrounding Mt. Merapi inherently more prepared in the face of disasters. Indian Ocean tsunami case has the least score compared to others, understandably being the first recent major disaster—caught people by surprise, while the others are more prepared learning from it. Early warning system of Indian Ocean tsunami and West Sumatera earthquake cases are tsunami early warning system, which the warning must be approved by the central government before being issued by local government—indicating a traditional top-down dissemination system, although this is understandable to prevent any ‘false alarm’ that could create a normalcy bias towards early warning system. Meanwhile in both volcanic eruption cases, warnings are issued by local volcanic observation station and disseminated through local volunteer groups, members of the group are part of the communities themselves, the sense of belonging and familial relationship towards members of the group make the community trusts their warning even more. It is shown that warnings issued by local community (bottom-up approach) is deemed more reliable by communities in preparing themselves for disaster, this approach by involving a community-based watch group could be beneficial in the future.

In the end, frequency of previous disasters and emergency period plays a huge role in disaster management—particularly in post-disaster recovery. Cases like West Sumatera earthquake and Mt. Merapi eruption has shown a higher preparedness and knowledge on disaster compared to the ones that struck the people by surprise such as Indian Ocean tsunami and Mt. Sinabung eruption. This also affects government’s commitment towards disaster and risk management, since the government are able to learn about the disasters beforehand. Volcanic eruptions have longer emergency periods compared to tsunami and earthquake that only struck a few times; Mt. Merapi and Mt. Sinabung are more complicated in term of IDP management and evacuation since the people could be displaced for a long time—like Mt. Sinabung, where the people are still in displacement since 2014. Risk management and act of disaster mitigation in volcanic eruptions could be neglected since it demands the government to multitask from having to prevent people from going back in to the hazard zone, giving access to livelihood, providing supplies, even to plan relocation and repatriation; this could be dangerous because it could create more unpredictable hazards. Meanwhile in disasters with shorter emergency period could focus themselves in relief distribution and recovery in clearer timeline.

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