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印尼馬魯古省西塞蘭縣Huamual區 的暴洪災害：潛勢與管理

Flash Flood Disaster in Huamual District, West Seram Regency, Maluku Province, Indonesia, Its Potential and Management

Adam Pamudji Rahardjo^a Akhyar Mushtofa^b Djoko Legono^a

摘 要

Huamual 區位於安汶塞蘭半島上，由於偏僻且交通不便，遠離縣城發達地區，以致於較為落後，因此，應當地需求，許多發展計畫應運而生。由於 Huamual 區常有暴洪災害發生，對經濟成長甚為不利，因此，當地政府及社區的抗災能力有待加強。馬魯古省災防局指出，2012 年 8 月 1 日馬魯古安汶市暴洪，Huamual 區受創最為嚴重。為了準備加強當地抗災能力計畫，有關 Huamual 區 Huamual 半島西海岸的災害風險情況調查已被完成，並將於本文中進行報告。

2014 年 7 月 14 日至 19 日已完成田野調查的基本研究，包括 Nasiri、Mange-mange、Amaholu Losi 及 Hatawano 等村落，田野調查除了收集二手資料外，也針對當地西塞蘭縣災害管理局職員、村落幹部、社區成員等進行訪談，並進行現場觀察及河床質取樣。本文將探討當地的災害風險面向，包括災害、脆弱性、能力等，另外，也探討減災面向，包括災前、災中應變，以及復原階段。

本研究有六大發現：(1)暴洪是除了山崩外最主要的自然災害；(2)社區雖位於好災區，但居民未能有足夠的災防知識，不過現在他們已漸漸知道；(3)西塞蘭縣災害管理局已成立兩年，但缺少經費及人力，以致於沒有年度的增能計畫、標準作業流程、及災防計畫；(4)沒有任何應對自然災害的社區整備，只能借重過去的災防經驗；(5)當面臨任何災害發生時，社區只能依賴自己的成員；(6)村落進行復原時，社區只能依賴印尼原住民的社區自助精神，以自有資源共同工作。

關鍵詞： Huamual 區、暴洪、災害風險管理

^a Department of Civil and Environmental Engineering, Universitas Gadjah Mada, Yogyakarta, Indonesia

^b Student at Master of Engineering in Natural Disaster Management, Faculty of Engineering, Universitas Gadjah Mada, Yogyakarta, Indonesia. E-mail: akhyar.m@gmail.com

Abstract

Huamual District which is located in west peninsula of Seram Island within Ambon Province is one of the under developed areas since its remote location and limited transport facilities from its regency capital and other developed areas. Therefore, the development program for that area needs to be boosted and secured. One of drawback of the economic development growth in Huamual District caused by current frequent flash flood disaster occurrences. Therefore, disaster resilient of both the local government and communities need to be strengthened. The Provincial Disaster Mitigation Agency of Maluku points that Huamual District was the most severe hit area by flash flood in Maluku beside Ambon City areas in 1st August 2012. In order to prepare a program for increasing disaster resilient in that area, investigation of the disaster risk condition along the west coast of Huamual Peninsula within Huamual District has been conducted and reported in this paper.

Reference study has been conducted followed by a field survey in the period of July 14th to July 19th 2014. The field survey was conducted on several sub-villages such as Nasiri, Mange-mange, Amaholu Losi, and Hatawano. The activities in the field survey were secondary data collection, interview to Local Disaster Management Agency (BPBD) of West Seram Regency staffs, to sub-village leaders, to local community members, visual observation survey and river bed material sampling. This paper discusses disaster risk aspect found in the areas which consists of hazard, vulnerability, capacity and also mitigation aspect which consists of pre-disaster, disaster response and recovery phases.

The results of this study are the following six findings. 1) The flash flood is the main cause of the natural disaster beside landslide. 2) Although the community settled in the prone area, they do not have knowledge about disaster mitigation but now, they are more aware. 3) BPBD in West Seram Regency has no yearly program related to capacity building, standard operating procedure, and disaster mitigation plan due to limited budget on local government budget and limited employee although 2 years of its establishment. 4) There is no community preparedness dealing with any kind of natural disaster except for their experiences in facing the past disaster. 5) The community still relies on their own members when facing any disaster response. 6) In recovering their sub-village condition the community relies on *gotong royong* spirit an Indonesian indigenous spirit of working together and also on their own resources.

Keywords: Huamual district, flash flood, disaster risk management

Introduction

West Seram Regency which is located in the west part of Seram Island and geographically lies between 1°19'-7°16' S, and 127°20'-129°1'E is part of Maluku Province administration. West Seram is a maritime regency since most of 79,000 Km² of its total area is sea. Land area of West Seram Regency is 6,948.40 Km². There are 67 islands, however, only 11 of them are inhabited. Huamual is one of

districts in West Seram Regency. It is located in the west peninsula of Seram Island and one of the under developed areas in the region (see Fig. 1). Although Huamual District is the third largest district in West Seram Regency in term of area, its population density is only 35 people/Km². However, in term of number Huamual is the biggest populated district with 40,854 (22.72%) people (Table 1.). In such spacious area of 1,126.99 Km² or 16.74% of West Seram Regency total land area, most people live in isolated alluvial fan areas of small to medium rivers along its coast due to hilly and steep slope landscape condition.

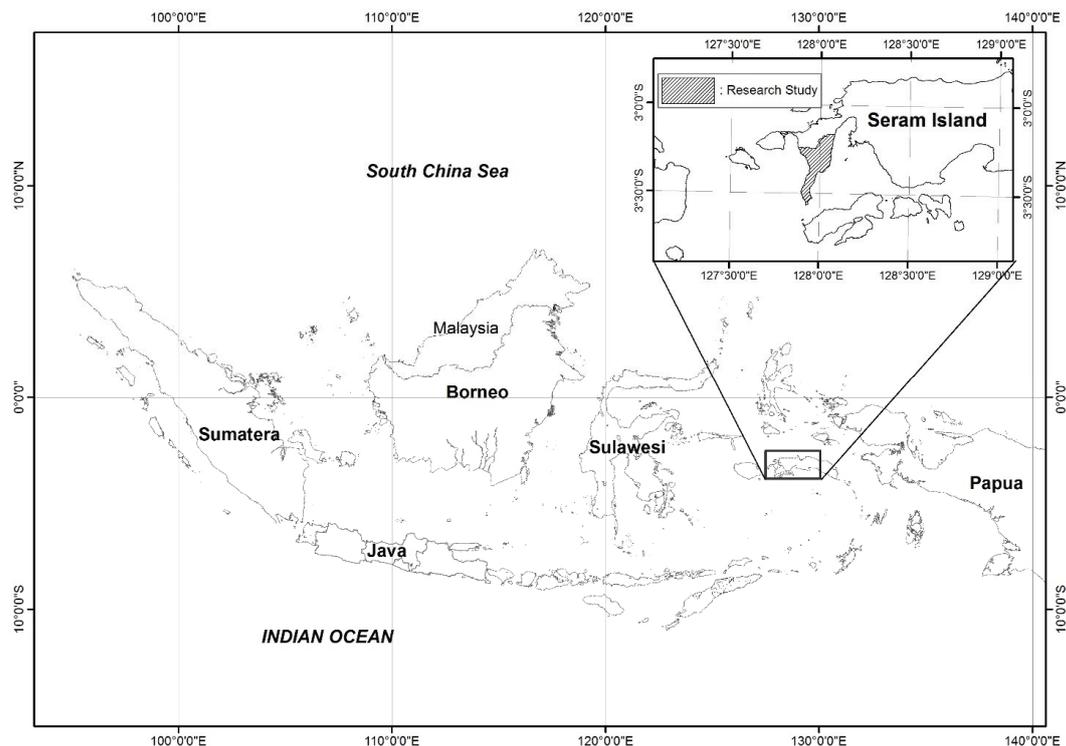


Fig. 1 Location of the study

On such harsh topographical condition, however, the combination of Huamual soil and weather condition is ideal for clove and cacao plantation. Therefore, most of its inhabitants are farmers instead of fisherman despite they live along the coast. Only in the south part of the peninsula where the geological condition is mostly of limestone fisherman are found. In fact, from year to year, fishery sector of Huamual District shows significant progress in term of production volume (Statistics of West Seram (BPS SBB), 2014). It seems that fishery sector is a potential one to become the main income of the people.

Table 1 Land area and population by district in West Seram Regency, 2013

District	Area (km ²)	Percentage (%)	Number of People	Percentage (%)	Population Density (people/ km ²)
Backside Huamual	409.65	5.90	26,567	14.78	65
Manipa Island	159.71	2.30	5,986	3.33	37
West Seram	503.33	7.24	28,388	15.79	56
Huamual	1,126.99	16.74	40,854	22.72	35
Kairatu	329.65	4.74	26,355	14.66	80
West Kairatu	132.25	1.90	11,490	6.39	87
Inamosol	504.61	7.26	5,502	3.06	11
Amalatu	665.35	9.58	11,412	6.35	17
Elpaputih	1,165.74	16.78	5,088	2.83	4
Taniwel	1,181.32	17.00	12,601	7.01	11
East Taniwel	733.80	10.56	5,538	3.08	8
Total	6,948.40	100	179,781	100	

Source: West Seram in Figures, 2014

Meanwhile, West Seram Regency is one of 183 regencies in Indonesia which is categorized as remote and underdeveloped areas by The Ministry of National Development Planning/ National Development Planning Agency (BAPPENAS, 2014b). As written in the national government policy, the remote and under developed areas has to be prioritized in the national development program.

The slow economic development growth in some areas such as in Huamual District is partly caused by frequent natural disaster events. The Local Disaster Management Agency (BPBD) of Maluku Province points that West Seram Regency is one of the most frequently hit areas by flood and landslide in Maluku beside Ambon City areas in 2012 (Fig. 2). Unfortunately, the most of flood and landslide disasters were in the Huamual District.

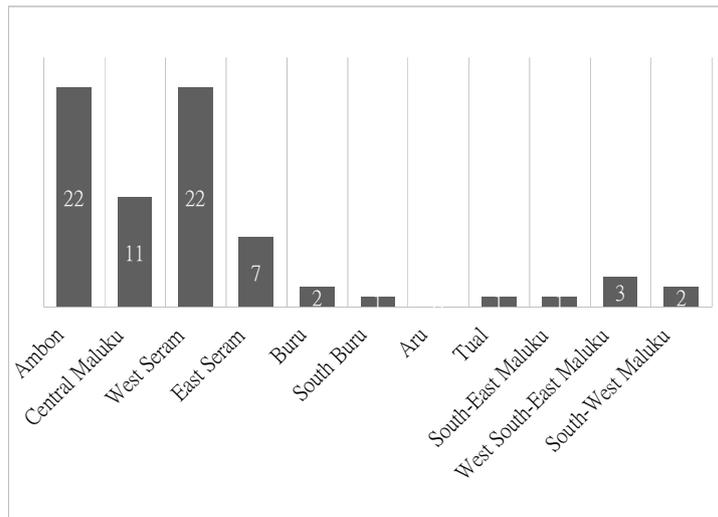


Fig. 2 Floods and landslides event in Maluku in 2012 (BPBD Maluku, 2014)

In the disaster management administration side, the Local Disaster Management Agency of West Seram was established in October 24th, 2012 based on a local government regulation letter. The National Government of Indonesia Law number 24, 2007 concerning Disaster Management has mandated all regency governments to form a local disaster management agency since 2008. The West Seram Regency itself was established in 2003. This condition shows that the disaster management has been positioned in low priority by the local government policy. Therefore, knowledge and awareness of disaster management need to be introduced in West Seram Regency as the first step in strengthening disaster resilience of both the local governments and communities.

In order to introduce a program for increasing disaster resilient in that area, investigation of the disaster risk condition in West Seram Regency, especially along the west coast of Huamual Peninsula within Huamual District has been conducted and will be reported.

Literature Review

1. Disaster Management Law in Indonesia

Indonesia as an archipelago country and due to its geographical conditions is frequently hit by natural disasters. Even, nowadays, Indonesia well known as a disaster supermarket due to frequent natural disaster events. The biggest disaster victims ever recorded and documented in one disaster event is that of Aceh tsunami disaster in 2004 that caused hundred thousands of people death. Two years later, a huge earthquake occurred in Yogyakarta in 2006. The disaster also took many casualties. At least more than 3000 people died. After that events, disaster management in Indonesia increasingly become an important issue.

The 1945 Constitution of the Republic of Indonesia has a mandate to the state of the Republic Indonesia that it has responsibility to protect the whole country by providing protection of life and livelihood of each Indonesian, including the protection from disaster. Therefore, one year after Yogyakarta earthquake disaster event, the Law Number 24, 2007 concerning Disaster Management was acted for a legally formal guidance by the government.

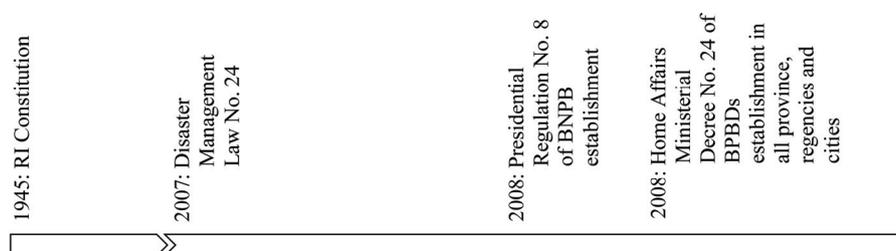


Fig. 3 Time line of disaster management law development

The Disaster Management Law Number 24, 2007 provides a comprehensive basis for disaster management (DM) during the three phases of the DM cycle. The Law mandates the creation of a National Disaster Management Agency (BNPB) at national level that reports directly to the President. Also, the law provides a mandate to the BNPB to coordinate all contingency, preparedness, mitigation, prevention, DM training, disaster risk reduction (DRR) activities (risk assessment and mapping) in the pre-disaster phase. In the response phase, the BNPB has the command and control of the coordinated responses of all actors (government, international organizations and non-government organization (NGOs)). And in the post-disaster phase, the DM Law empowers the BNPB to coordinate the damage and loss assessments, and coordinate the implementation of rehabilitation and reconstruction.

At local level, after the President issued a Presidential Regulation Number 8, 2008 for establishing BNPB, the Minister of Home Affairs issued Decree Number 46, 2008 requiring the establishment of Local Disaster Management Agencies (BPBDs) in all provinces by the end of 2009. The national government made it mandatory for BPBDs to be established in every province and hence the provincial governments have a budget line for DM. Time line of the disaster management law development is shown in Fig. 3

The new DM Law includes hefty criminal sanctions placed on government and civil servants for failure to protect citizens 'pre-, during, and post-disaster phase'. The Law also mandates the government to provide compensation for victims of disasters. This potentially enormous recurring cost builds the economic case for the government to ensure more effective DRR, mitigation and preparedness.

2. Disaster Management

According to the DM Law, disaster is an event or series of events that threaten and disrupt the lives and society livelihoods caused either by natural factors and / or non-natural factors and human factors that resulted in the emergence of human casualties, environment damages, property loss, and the psychological impact. Whereas natural disaster shall mean an event or a series of events caused by nature such as earthquake, tsunami, volcanic eruption, flood, drought, typhoon, and landslide.

Meanwhile, UNDP, 2004, define Natural disaster as "*A serious disruption triggered by a natural hazard causing human, material, economic or environmental losses, which exceed the ability of those affected to cope*". Natural disaster events can be categorized into two kinds, there are slow-onset and rapid-onset disaster events. The hazard of the slow-onset disaster events can affect victims for many days, months or even years. Drought is a prime example of this kind of disaster events. On the other hand, rapid onset disaster events which can be triggered by instantaneous shocks may affect victims in medium or long-term impacts. An earthquake is a prime example for rapid-onset disaster.

Disaster events could be triggered by many factors of natural phenomena, human activities or both. As a part of human activity, development could increase disaster risk. There are many examples of the drive for economic growth and social improvement generating new disaster risks. Rapid urbanization is an example. The growth of informal settlements and inner city slums, whether fuelled by international

migration or internal migration from smaller urban settlements or the countryside, has led to the growth of unstable living environments. These settlements are often located in ravines, on steep slopes, along flood plains or adjacent to noxious or dangerous industrial or transport facilities.

“Natural disaster risk is intimately connected to processes of human development. Disasters put development at risk. At the same time, the development choices made by individuals, communities and nations can generate new disaster risk. But this need not be the case. Human development can also contribute to a serious reduction in disaster risk” (UNDP, 2004).

Related to human development, however, Indonesian National Planning Agency (BAPPENAS), 2014a, has several strategies to accelerate the remote and underdeveloped areas. These strategies are divided into 5 sectors, there are 1) developing the local economy, 2) society empowerment, 3) opportunity widening with development area, 4) capacity building of its institution’s human resources and its society, and 5) mitigation and rehabilitation building from disaster. These strategies show that government not only accelerate the development processes but also secure it from disaster.

In the development processes, disaster risk must be considered seriously in preparing to respond any possible disaster event in the future. The UNDP, 2004, define risk as “*the probability of harmful consequences, or expected loss of lives, people injured, property, livelihoods, economic activity, disrupted (or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions*”.

The UNDP, 2004, and most literature express risk by the equation 1 (Wisner, *et al*, 2006; von Kotze and Hollaway, 1999 in Jordaan, 2006):

$$R = H \times V \quad 1)$$

where R is risk, H is hazard, and V is vulnerability.

Others expand the formula by adding manageability or capacity to the equation and propose the equation 2 (Heijmans and Victoria, 2001; ISDR, 2000 in Jordaan, 2006):

$$R = \frac{H \times V}{C} \quad 2)$$

where C is capacity.

Risk component should be well understood and well defined to assess it accurately. Hazard is related to external factors. In term of natural hazard, UNDP 2014, define hazard as a processes or phenomena occurring in biosphere that may constitute a damaging event. Hazardous events may vary in magnitude, frequency, duration, area of extent, speed of onset, spatial dispersion and temporal spacing. Whereas, vulnerability is condition or process resulting from physical, social, economic and environmental factors, which determine the likelihood and scale of damage from the impact of a given hazard.

Others, capacity is the capacity of a system, community or society to resist or to change in order that it may obtain an acceptable level in functioning and structure. This is determined by the degree to

which the social system is capable of organizing itself, and the ability to increase its capacity for learning and adaptation, including the capacity to recover from a disaster. Capacity may close in term with resiliency.

Article 33 of the DM Law points that disaster management shall comprise of pre-disaster, emergency response, and post-disaster phases. At pre-disaster phase, disaster management shall include 1) disaster management planning, 2) disaster risk reduction, 3) prevention, 4) integration into development planning, 5) disaster risk analysis requirements, 6) spatial structure plan implementation and enforcement, 7) education and training, and 8) technical standard requirement for disaster management. This phase covers mitigation and preparation activities.

Meanwhile, during the emergency response phase (Article 48), disaster management shall include 1) quick and appropriate study of location, damages, and resources, 2) deciding on the disaster emergency status, 3) rescue and evacuation of disaster-affected community, 4) fulfillment of basic necessities, 5) protection for vulnerable group, and 6) immediate recovery of essential facilities and infrastructure. The last, disaster management at post-disaster phase shall include 1) rehabilitation, and 2) reconstruction.

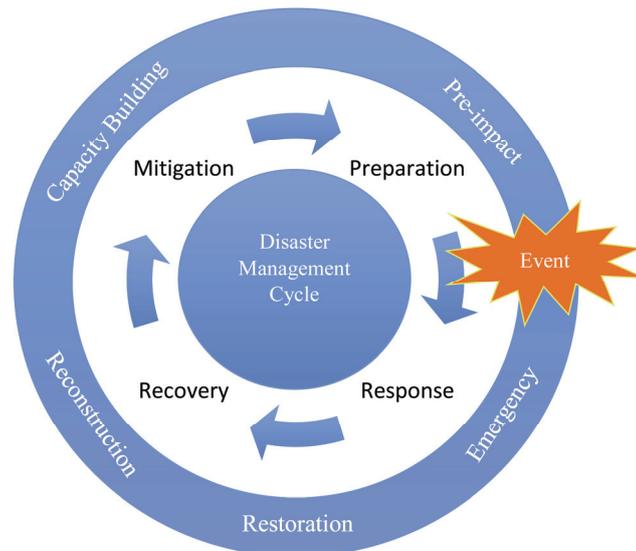


Fig. 4 Disaster management cycle (ADMIRE, 2014).

The task of local disaster management authorities, BPBD, is described in the Article 21 of the DM Law. That article stipulates guidelines and directions in accordance with local government and BNPB policies on disaster management that include disaster prevention, emergency response, rehabilitation, and reconstruction in a fair and equitable manner. The article also stipulates disaster management standardization and requirements by virtue of legislation, preparing, deciding on, and disseminating maps of disaster-prone areas, and preparing and deciding on disaster handling standard operating procedures.

Survey and Investigation Method

Reference study has been conducted followed by a field survey in the period of July 14th to July 19th 2014. The field survey was conducted on several sub-villages such as Nasiri, Mange-mange, Amaholu Losi, and Hatawano. The activities in the field survey were secondary data collection, interview to BPBD of West Seram Regency staffs, village authority staffs, local leaders and local communities, visual observation survey, and river bed material sampling.

These various field surveys were conducted to understand the real condition of people perception and awareness of disaster, infrastructure condition such as accessibility of the road, medical facilities and also educational facilities. The condition of land use (coverage) of the upper part of the rainfall catchment area was visually observed. The condition of soil grains on the surface and river bed were also sampled for obtaining grain size distribution. These data will be used to conduct numerical simulation to confirm the past flash flood event and to predict the effect of possible future flash flood events with several scenarios. At the end, the data obtained will be analysis to provide an appropriate comprehensive disaster countermeasure to support the task of BPPD of West Seram Regency and Maluku Province.

Information were grouped into information related with risk dimension including hazard, vulnerability, capacity, and disaster mitigation dimension including pre-, on-, and after-disaster event periods.

Discussion of Survey Results

1. Natural Disaster Hazard

Generally, West Seram Regency has tropical and monsoon climates due to its location that is within tropical zone and surrounded by vast seas. Therefore, these climates are most affected by the vastness of the seas, namely western monsoon or northern monsoon, and eastern monsoon or south-eastern monsoon. Heavy rainy season mostly occur during June to August every year namely eastern monsoon. Fig. 5 shows the monthly rainfall from 2003 to 2014 in Kairatu Climatology Station, West Seram Regency. There are several rainfall stations surrounding the study area even though it does not close enough to represent the real situation. The stations are Pattimura Climatology Station and Kairatu Climatology Station. Its location is approximately more than 40 km far away from Huamual District.

According to local people, natural disaster in Huamual District especially in the west coast of the peninsula has been rare events in the past decades. Frequent events of flash floods show increasing after 2012. The first flash floods that hit these areas start on August 2012. In August 1, 2012, most regions in Huamual District were hit by flash flood due to heavy rainfall intensity. Its peak recorded at 225.2 mm/day on that day and the most severe area is Nasiri Sub-village where 61 houses and school buildings were reported damaged and some of them were completely washed away. Fortunately, there is

no casualty on this flash flood event. It may be caused by the fact that the event happened in the morning when people has already waken up and does activity in the outside.

The history anomaly of the flash floods has start in 2012. As a comparison, although in 2008 at the same month, June and August, has higher rainfall intensity, there was no flash floods happening. This anomaly also convinced by information got from local people and also the head of sub-village that as long as they live in their sub-village for more than 40 years, they never experiencing such huge flash floods before 2012. These kind of flash floods had been made them realize that they now settle in the flood disaster prone area and may be due to their exploration on the hill slope areas has exceeded their natural capacity.

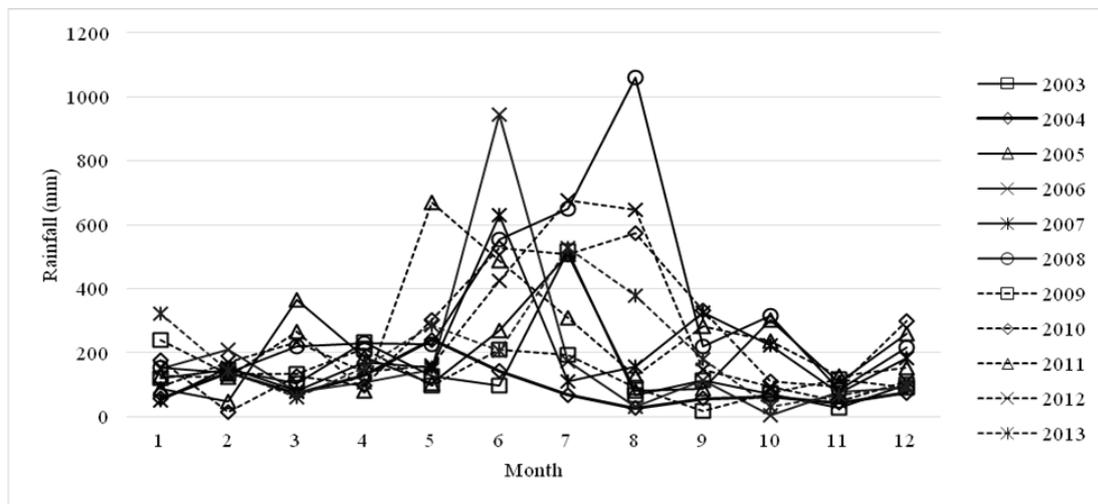


Fig. 5 Monthly rainfall in Kairatu Climatology Station.

2. Vulnerability of the Communities

Most inhabitants in these sub-villages are settled in flood disaster prone areas. They are forced to live there due to very little flat land area available to be settled for housing. Most of the areas are in hilly and steep slope topography. Therefore, there is no choice to settle except in the place now they were settled. Mange-mange Sub-village, for instance, settled on the narrow valley with ravines on both sides (Photo 1). This place is a very vulnerable of flash floods or landslides that can occur suddenly. Photo 1 was taken at the right side of its ravines.



Photo 1 Current condition of housing in Mange-mange Sub-village on July 17th, 2014.

Meanwhile, Nasiri Sub-village lays on the mouth of Nasiri River that has the biggest rainfall catchment area among those of neighboring rivers. Its upstream area also has such topographical condition. Housing in this sub-village settles in flood plain and mostly on the right side of the original river (Fig. 6).

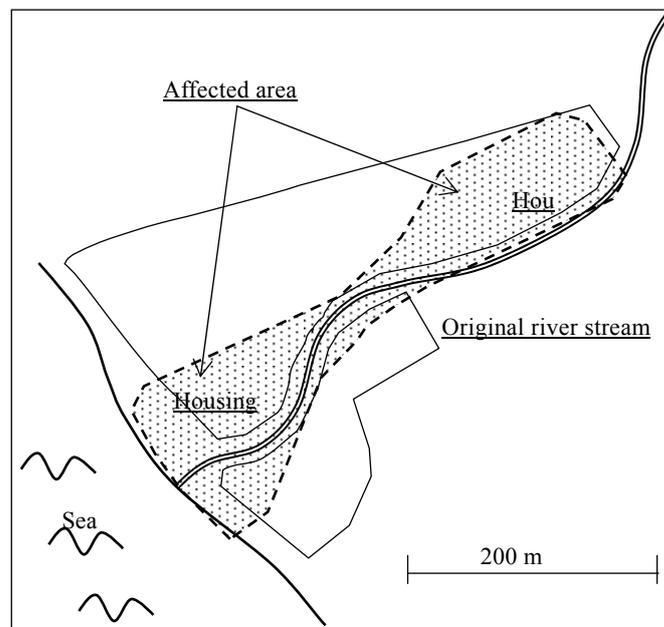


Fig. 6 Affected area of flash floods in Nasiri Sub-village

Photo 2 shows current condition in Nasiri Sub-village on July 17, 2014. Its condition has changed due to huge flash flood that hit this sub-village in 1st August 2012. Many houses had been swept out by flash flood. Some months later, they moved to slightly safer or higher places.



Photo 2 Current condition of housing in Nasiri Sub-village.

Beside Nasiri Sub-village, Amaholu Losi Sub-village also has severe impact of flash flood. Photo 3 shows current river condition in Amaholu Losi Sub-village 2 years after. The photograph was taken toward upstream. The original river is approximately 2 m wide, and now become 5-7 m wide. Same as Nasiri Sub-village, fortunately, there was no casualty in Amaholu Losi and just few numbers of houses which were damaged. Fig. 7 shows the map of those sub-villages.

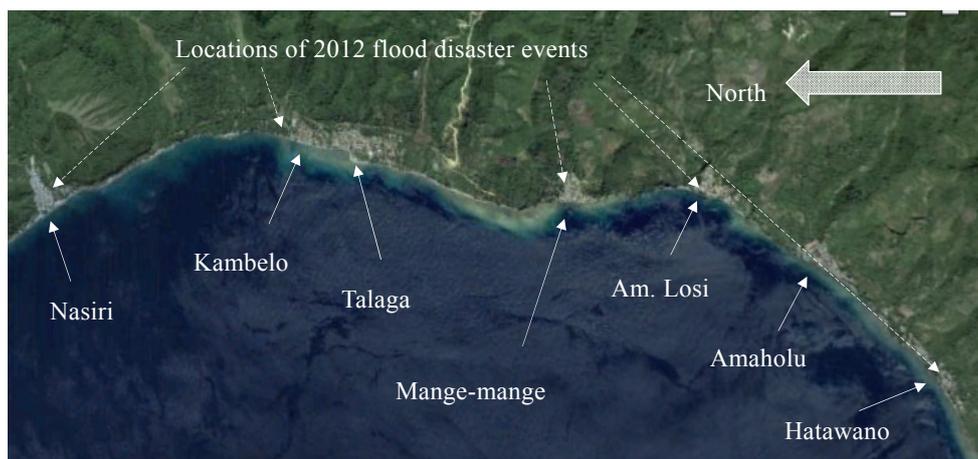


Fig. 7 Map of sub-villages that were hit by flood or debris flow disaster in 2012



Photo 3 Current river condition in Amaholu Losy Sub-village.

3. Resiliency of the Communities

Flash flood has big impact on people's life in these sub-villages. Even, after two years of disaster, they still in traumatic condition in every rainfall occurrence. But positively, they are now more aware. Learning from past disaster they faced, they will be more resilient against flash floods little by little. For example, every light rainfall event, currently, they will be on alert.

People in these sub-villages are realize that they are settle in the flood disaster prone area, but on the other hand, there are very few ideal places to be settled and also due to their livelihood as a farmers and fisherman they prefer to stay there rather than to relocated to other saver places far from their current place. Interview session (Photo 4) results with local people and several head of sub-villages provide information that at the event of the disaster, they relied on their own members in the disaster response since neither neighboring communities nor local government reached them and gave help. Even, at the rehabilitation and reconstruction phase, they still relied on their own members and their own resources in recovering the damages with *gotong royong* (community self-help) spirit, an Indonesian indigenous spirit of working together.



Photo 4 Interview session with head of Nasiri Sub-village, on July 17, 2014.

On the other hand, BPBD of West Seram Regency as the authorized local agency for disaster management which is responsible in disaster management yet does not have any regular program related to community capacity building, standard operating procedures for disaster response and any disaster mitigation plan. This condition is caused by limited budget for disaster mitigation of the West Seram local government and there has been limited number of staffs since its establishment two years ago.

After all, people in Nasiri and Amaholu Losi are still expecting on government or local government help to protect their houses from future hazard of flash floods by constructing dikes on both sides of the rivers. Their conventional mindset of disaster mitigation is only implementing structural measures.

Photo 5 shows normalization of river stream in Nasiri Sub-village that has been done by the Maluku River Basin Office (BWS Maluku) in 2013 with temporary training dike made from in-situ materials and gabion structures.



Photo 5 Normalized river stream in Nasiri Sub-village, photo taken toward upstream (left), and toward downstream (right) on July 17th, 2014.

Conclusion

The results of this study and survey are 1) the flash flood is the main cause of the natural disaster beside landslide, 2) although the communities are settled in the prone area, they do not have knowledge about disaster mitigation, however, the appearance of growing awareness among them is observed, 3) BPBD in West Seram Regency has no yearly program related to capacity building, standard operating procedure in case disaster occurred, and disaster mitigation plan due to limited budget on local government budget and limited employee although 2 years of its establishment, 4) there are not yet community preparedness dealing with any kind of natural disaster except for their experiences of facing the past disaster, 5) the community rely on their members when facing the disaster and 6) recover their sub-village with community self-help spirit and also with their own resources.

Recommendation

It is recommended for local government and also the BPBD of the West Seram Regency to have a disaster management plan to deal with natural disaster especially flash floods, to mitigate and counter measure and also to secure its development processes.

Campaign for the importance of disaster mitigation budget allocation to the members of parliament or political party leaders in the West Seram Regency is very important since the parliament has authority for yearly budget approval.

Future research is also needed to cope with every aspect related to disaster management in larger area beside Huamual District.

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