Vulnerability by people: lesson learned from vulnerable group in kampong aur medan in facing floods

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Abstract. The flooding in Medan due to heavy rainfall area has become a daily problem to the community who lives in the riverbanks. It has been happening since many decades ago, but they are still there. Information on the vulnerability to natural hazards on a local level may help decision makers, stakeholders, and others to make better decisions regarding an effective disaster management. This study uses a qualitative approach to measure the level of vulnerability of communities in facing floods. The study identified how the communities perceive their exposure to the hazard, their sensitivity and their adaptive capacity. This study found the community already accept floods as a part of their life although the floods cause many losses. The experience in facing floods, strong social neighbourhood and strong local leadership are the capitals of the communities to survive. So vulnerability assessment at the community level should be constructed based on the perception and meaning of the community.

1 Introduction

Studies on vulnerability, particularly due to floods, have been largely undertaken primarily by governments, academics and non-government organizations (NGOs). Most of the vulnerability studies based on only secondary data. Often the policies taken are not in accordance with the needs of the community because less involvement of the community. The government has already made various efforts to reduce negative impacts of floods but not people's vulnerability [1].

The assessment of vulnerability becomes important, especially since the focus shifted from a technical hazard perspective to a more social centered one [1]. Vulnerability, defined as the losses potential, is an essential concept in hazards research. Vulnerability is also the focus of the development of hazard mitigation strategies at the local, national and international level [2]. The vulnerability is a function of the exposure (who or what is at risk) and sensitivity of a system (the degree to which people and places can be harmed) [3,2]. The IPCC definition [4] of vulnerability is a degree to which a system susceptible and incapability to cope with adverse effects (of climate change). In this paper, vulnerability is the degree to which a community, a household or a person is "likely to experience harm due to exposure to a hazard, either an exogenous perturbation or an endogenous stress or stressor" [5].

In the last two decades, flood was recorded as the most frequent disaster happened in Indonesia, including its big cities, like Medan City especially in the rainy season. There are 7 (seven) sub-districts regularly experience floods every year in Medan City with the various characteristics of the location and the victims. The poor is the most vulnerable group to the disaster [6]. Then it is assumed that the slum dwellers in the city are the most vulnerable to the disaster [7].

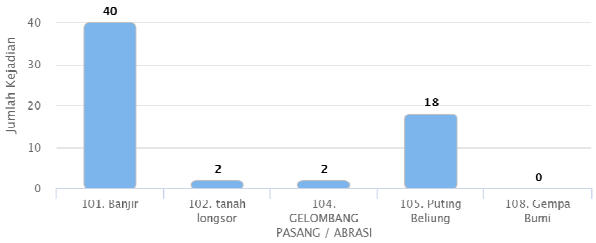

Fig. 1. Disaster in Medan City 2000-2017
Source: DIBI, BNPB (accessed 31 March 2018)

In many cases, the densely populated urban areas or urban slums, high vulnerability and high risk do not reduce the population, even increase in some locations [7,8]. The ability of slum dwellers to manage the floods for decades becomes an interesting research topic. Their knowledge and capabilities over the time can be a good idea to reduce vulnerability in the other similar areas. Their vulnerability determination and actions are the unique local factors and recognized as key factors in building disaster risk management capacity at the local level [8].

This study uses a qualitative approach to measure the level of vulnerability of communities in facing floods. The individual interviews and focus groups discussions are the tools to learn about the factors establishing the vulnerability from the local people. This study takes the study case in Kampong Aur Kota Medan as the representation of urban slum and dense community in the big city. This Kampong is located in the center of

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Medan City, on the edge of the Deli River, very often flooded. The residents in the area still survive even though there are three to four times a month must deal with floods. The inhabitants here accept the risk of flood as trade-offs in contrary to the opportunities their residential location.

2 Material and method

The concept of vulnerability is still a lot of debate, especially in the context of climate change and natural hazards, resulting in various definitions and approaches [3, 9, 10]. This study refers definition of vulnerability combine with human-environment systems [5]. It consider the complexity of vulnerability consists of multiple interacting social, economic and environmental factors operating on different spatial scales. The concept of vulnerability comprises three fundamental dimensions, namely exposure, susceptibility and resilience/adaptive capacity [3, 11].

This study consider the exposure, sensitivity and adaptive capacity as variables of vulnerability, which measured by the experiences of villagers. This approach referring to the previous study [12]. Qualitative methods reconstruct how people experience and make sense of their lives [13]. Thus, they try to take up the specific perspectives of the interviewees. In comparison, the quantitative approaches with weighted indicators, these individual perspectives provide supplemental and deeper information about distinct perceptions and factors determining vulnerability [1].

The validity of the information obtained if the results of in-depth interviews and FGDs indicate consistency. The content analysis to classify the causes and effects of floods, which is the value of the exposure and the resulting impact to the sensitivity.

Fig. 2. FGD situation in Kampong Aur
*courtesy: Human Ecology team LIPI, 2017

3 Results and discussion

3.1 Kampong and flood risk

Decentralization, to some extent, has drastically contributed to rural and urban development transformation and, including the governance system. In this phase, there is a vivid situation which showed about urbanization process, it's triggered by people who migrated from rural to urban area. They mobilized because there are better opportunities in cities [14].

Thus, the terminology of *Kampong* itself can be defined as a dwelling place where migrants inhabit or traditional settlements of local people. Since the majority of people come from low-income level, they usually have limited infrastructure and services, such as lack of proper clean water and sanitation supply, electricity connection and also solid-waste disposal. Again, [15] implied that the concept of *Kampong* in an urban area is categorized as a slum, and it has to be considered not only as an area, but also as a cultural expression. Low-quality housing standard and limited infrastructure and are the symbol of urban poverty. Furthermore, [16] added that *Kampong* in urban areas are densely populated, because urbanization has occurred around them. *Kampong* mostly located in strategic parts of the city, where its near government centers, markets, and other public facilities. *Kampong* which attached city could be classified either by location or by its type of development.

Table 1. Classification of *Kampong*, by location and type of development

Classification of *Kampong*	
By location	By type of development
• Open Kampongs: have direct access to principal streets • Semi-open Kampongs: in commercial areas, but "closed" (surrounded) by public buildings • Closed Kampongs: in inner-city areas, but away from main streets • Fringe Kampongs: in the periphery of built-up areas; usually with high population growth • "Rural" Kampongs: still within the administrative boundaries of cities, bult with a strong rural atmosphere; easy access to urban facilities	• Traditional Kampong: mostly old and built by the earliest inhabitants of a city • Built by city government during the colonial period: in strategic locations to provide cheap labor to wealthy areas • Regularized: originally squatters on public land, primarily before the enactment of the Agrarian Law no. 5/1960 • Reclaimed and regularized: very similar to the previous one. But on reclaimed land. Primarily coastal areas, cemeteries, or marshlands. • Marginal Kampongs: do not conform to land-use plans, and cannot be regularized due to problems of land rights and/or marginal land, along the main storm drains or railroad tracks

**adapted from[16]*

Flood makes bigger economic losses and environmental damage than decades ago [15]. Medan, a city with more than 2 million of population and the fourth most populated city in Indonesia regularly attacked by flood [18]. This city has big rivers; Deli River, Babura River and others, which might cause flood every year. The Medan most crucial thing is an overexploitation of natural resources in an upstream area [19].

According to the Regional Agency of Disaster Management (BPBD) Medan, the big floods happened 5 (five) times in urban area [20]. The last flood happened on September 27, 2017, which caused the water debit in the Deli River up to 80 cm and shanked 60 houses. The detail of flood disaster in Medan can be seen in Table 2.

Table 2. Flood in Medan during 2000 – 2016

Year	Disaster	Losses/damages/victims
2001	Flash flood	No data*)
2003	Flash flood	154 people swept away
2009	Flash flood	25 people died
2011	Flash flood	70% of residential soaked
2012	Flood caused by river flows	5 villages soaked 11 houses swept away 40 houses were heavily damaged 740 HH displaced
2014	Flood caused by river flows	12 sub-district sunk
2016	Flood caused by river flows	4 sub-districts sunk
2017	Flood caused by river flows	60 houses sunk

**data is collected from many sources*

One of the *Kampong* with densely populated and located in the river banks of Deli River is *Kampong Aur.* The community in *Kampong Aur*[a] has experienced flood many times. From a social perspective, the community in *Kampong Aur* has unique socio-cultural and historical conditions. *Malay* and *Minangkabau* culture has been driven in *Kampong Aur* since the Sultan of Deli. It shapes their social character for being 'united' and it will be impacted by their capacity to cope with environmental changes and floods [21]

3.2 The role of kampong in adapting to flood

The informality of *Kampong* is embedded because of the urbanization process which occurred since 1970s. Even though informality in urban context do not have a direct correlation with marginality, but at one side, the sense of 'informality' can be seen in many sectors of *Kampong* in an urban area, such as; informal settlement, informal job and informal market which always associated with urban poor communities.

The poor condition and also the risk situation become the major that led *Kampong* to be unsafe. Therefore, *Kampong* has actually had the important role for urban poor community, because it is their first protector when disaster attacked. Due to that reason, urban poor people who reside in *Kampong* have to adapt to disaster, either as an individual or even as a community [22].

The poors are the most vulnerable groups when the disaster happened [23]. In addition they have limited resources to survive during pre, emergency or even during post-disaster periods which become the biggest obstacle for the urban poor community. In *Kampong Aur*, people are getting used to the flood and they can manage the risk by traditional or local practices.

Fig 3. *Kampong Aur* in Medan
*courtesy: Human Ecology team LIPI, 2017

3.3 Local knowledge in measuring vulnerability of flood in kampong aur

The experience of regular flooding makes the people to survive or spontaneous capacity in the face of severe floods. Floods seem to be accepted as part of their lives, considered no big deal anymore. In some decades, their knowledge in the facing floods is transferred from generation to generation. There is inherited knowledge related to the physical condition of buildings that begin transforming from one floor to two floors (70% of houses have 2 floors).

3.3.1 Kampong's exposure

Exposure is the nature and degree to which a system experiences environmental or socio-political stress [3]. The characteristics of these stresses include their magnitude, frequency, duration and areal extent of the hazard [24]. Local knowledge of Kampong Aur residents is recognized for their ability to understand the exposure of their residential location. Floods that occur in their area come from the upstream during the rain. When the river water is already cloudy, a lot of garbage on the river and the increase water flow are the sign that the great flood is coming soon. The condition of this river is usually first recognized by residents whose dwellings directly adjacent to the river. They then informed the surrounding neighbors, and the information then spread throughout the people in Kampong.

Although Kampong Aur is often shanked, the flooding characteristics in this area are rapidly declining. Floods generally rise in the night until early morning (22:00 - 03:00 in the morning) then began to move away in the morning and in the afternoon people can clean up again. Not only cleaning their homes, residents also have to work hard to clean up the environment so that daily life can run again.

[a] *Kampong Aur* is a densely populated residence located in Medan Maimun Sub-district, Medan. This area is located in the Deli river-banks

Fig. 4. Entrance to *Kampong Aur*
*courtesy: Human Ecology team LIPI, 2017

3.3.2 Kampong's sensitivity

Sensitivity is the degree to which people and places can be harmed [3, 2] Kampong Aur residents are aware of their own conditions contributing to their level of vulnerability. Socio-economic conditions of society also greatly affect the vulnerability of the population. The limited resources they have make them limited in carrying out sustainable adaptation measures. Since poor conditions make them do not have many valuables property to be protected so they tend to think the flood is not a high threat to their assets.

On the other hand, the high relationship (Kampong Aur is still homogeneous with 90% of its inhabitants are Minang people) forming strong social bond that play a major role in the facing floods. Local leadership, as well as the presence of youth groups are ready to help evacuation in case of flood. That is why casualties are very rare in the Kampong.

3.3.3 Kampong's adaptive capacity

Kampong Aur peoples have adapted independently based on the experience of flooding many times over the decades. Most of the two-floor buildings where generally have the ground floor with no valuables things that may be damaged by flooding.

There are no long-term adaptation activities to reduce the impact of flooding. Besides due to unsecured land occupancy, the limited economic conditions and floods that come almost once a week keep the residents' time and energy running out for cleaning, without having to think about long-term solutions to the reduction of flood impacts and losses. Residents tend to let the floods come and then clean the house.

4 Conclusions

There are three interesting findings from the Kampong Aur as a case study. First, the people already considers that flooding is a routine regular occurrence, part of their lives. However, they are also aware that the floods bring many losses both economically, physically and time. Second, their experience of flooding makes them have a "own system" that is already running well when the flood comes, starting from the preparedness, early warning, response and recovery. Thirdly, local leaders play a major role in dealing with floods. The local leader is not only the head of the neighborhood but also the social groups such as the youth group. Youth groups spontaneously move to help to evacuate goods or people in case of flood. This strong social bond becomes a power in facing of floods.

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