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# Community Participation in Flood Disaster Mitigation Oriented on The Preparedness: A Literature Review

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**Abstract.** The purpose of this paper is to examine community participation in mitigating flood preparedness. The method used in the form of meta-analysis from the literature study of various journal articles in 2011-2019 with the topic of flood disaster mitigation in Indonesia includes Sumatra, Java, Sulawesi, Kalimantan, taken from the international journal Disaster risk reduction, Sumatra Journal of disaster, geography and geography education Jamba: Journal of disaster risk studies, nature science, and from international seminars. The lack of articles in Indonesia that discusses public participation in English language flooding disasters such as articles from other countries, causes this research has never been done. The review results show that of the 9 articles used, it turns out that community participation in dealing with floods in several regions in Indonesia is included in the active category. Forms of participation include participation in the form of money, labor contributions, inter-community education, supervision of infrastructure development and the addition of green open space.

## 1. Introduction

Indonesia is located at the confluence of four active plates, namely Eurasia, Indo-Australia, the Pacific and the Philippine Sea. The subduction zone due to the Indo-Australian plate collision with the Eurasian plate is located on the west coast of Sumatra, south of Java, and continues to Nusa Tenggara [1]. This condition makes Indonesia very vulnerable to disasters. Natural disasters are serious problems that can cause human, material, economic, or environmental damage[2]. Floods occur almost every time in the territory of Indonesia equally. These disasters occur caused by two factors, namely natural factors and human factors. Natural factors that can cause floods are partly due to the heavy rain that occurs continuously for a long time, silting rivers. Whereas the human activity factor is population density which then gives rise to new settlements, deforestation, cement-covered land, garbage piling, and others.

Flood disaster occurred in all regions | Indonesia. In Lampung, floods inundated 300 residents' homes precisely in South Lampung. Early in 2019, flash floods occurred in South Sulawesi and Sentani regions. Of the 14 regencies/cities, five regions are considered to be very prone to flooding in Lampung Province, namely Pesawaran Regency, West Lampung Regency, Pesisir Barat, Tanggamus, and South Lampung. Pesawaran Regency is always hit by floods every year due to deforestation and is a low-lying area. In West Lampung Regency, because the area is hilly, landslides often occur. Anthropogenic factors such as unplanned urbanization road construction or expansion of areas built on hillside, deforestation and improper land use have further exacerbated the fragile environment resulting in more erosion and landslides [3].



Generally, when a disaster occurs, a fundamental problem that arises is the unpreparedness of the community to deal with it. Thirty-five percent is an effort to save themselves, then 31% is done by family, 28.1% neighbors or friends. "And 2.6% by passers-by and 1.7% were carried out by the SAR team. Not knowing the location of the gathering point and the direction of the evacuation route both at home and outside the home, violating the warning signs of the danger zone/area. Panic and haste when a catastrophic event results in an accident, being electrocuted during a flood, lack of direction in handling for vulnerable groups, especially the elderly. Even though they know that the area often occurs, but surprisingly people are still reluctant to leave the area for various reasons. loss, of course, the community itself, resulting in stress, panic, loss of life, loss of property, coordination between the community and the government becomes unclear, the distribution of aid is chaotic, slow physical recovery of buildings, emerging diseases, the economy is hampered and others. The community must be invited to think logically in solving existing problems. So that the unpreparedness of the community against disasters can be reduced[4].

The unpreparedness of the community in dealing with disasters can be overcome by mitigation. Mitigation is a series of efforts to reduce disaster risk, both through physical development and awareness-raising and capacity building to face the threat of disaster[5]. Therefore, the government then issued law number 24 of 2007 concerning disaster management efforts. Disaster management activities can be divided into 4 categories, namely activities before a disaster occurs (mitigation of preparedness), activities when a disaster occurs (protection and evacuation), appropriate activities after a disaster occurs (search and rescue), post-disaster activities (recovery/healing and repair/rehabilitation). Preparedness is done to ensure fast and appropriate efforts in dealing with disaster events [6].

Preparedness is one of the efforts made to anticipate the possibility of disaster to avoid any loss of life, loss of property and changes in people's lives in the future [7]. Preparedness becomes wider, namely minimizing the adverse effects of a hazard through actions effective preventive, rehabilitation and recovery measures to ensure the organization and delivery of assistance and assistance in the aftermath of a disaster in a timely and effective manner[8]. The disaster preparedness parameter is knowledge and attitude towards disaster risk, policies and guidelines, plans for emergencies, warning systems early on and the ability to mobilize resources. The community as the initial perpetrators of disaster management as well as victims of disasters must be able to within certain limits handle disasters so that it is hoped that disasters will not develop to a larger scale. This means that public awareness is needed in efforts to deal with floods.

Research meta-analysis that has been carried out, among others, discusses the pre-disaster plan and prevention efforts in the dangers of flooding and drought[9]. Many meta-analysis studies have been conducted and generally refer to articles from various countries in the world so that a comparison is done. Only a review of people's perceptions about the mitigation of flood disaster preparedness, especially in Indonesia, has never been done. Therefore this article is necessary to examine how the actual participation of the Indonesian people themselves when mitigating preparedness for flood disasters whether active or passive participation.

## **2. Methods**

The method used is a literature review with research design in the form of a meta-analysis[10]. Data collection techniques use article documentation obtained from international indexed journals Disaster risk reduction, Sumatra Journal of disaster, geography and geography education, Jamba; Journal of disaster risk studies, and from Seminars international and international seminar proceedings in English in Google scholar due to open access so that everyone can read the article, like research conducted by[11] Data obtained from books that are trusted. The article used as a literature review is time-limited from 2012-2019 in the hope that there will still be a similarity in the treatment of flood disasters that occur in Indonesia. The population in this study are all articles about community participation in dealing with floods in Indonesia, 15 articles are obtained. After reading the entire contents of each article, 6 articles are not used and 9 articles are used as material for article review. Where the nine articles represent Sumatra, Java, Kalimantan, Sulawesi, DKI Jakarta, Sumbawa Region. Keywords

used to search for article material is to use the word "*Flood disaster mitigation in Indonesia*" and *Community Participation in Flood Disaster in Indonesia* ".

### 3. Results and Discussion

The articles used as research samples were taken from journals registered through Google Scholar and Scimago with international journal criteria and international seminar proceedings in English. Selection criteria Selected articles are articles that directly refer to the name of the location in the territory of Indonesia, with the intention that the disaster preparedness mitigation study has been implemented directly in the field and easily read by everyone because of open access. From the search results obtained 9 related articles[7,12- 18].The characteristics of the article are as follows.

**Table 1.** Characteristics of Research Samples

Number	Title	Name	Years	Name of journal/proceeding
1	Community Participation in Flood Disaster Management in Sumbawa Regency (case study in Songkar Village)	Hendra Wirawan Zakariah, Kismartin	2018	The 3 <sup>rd</sup> International Conference on Energy, Environmental and Information System (ICENIS 2018) vol. 73, pp. 0–4, 2018.
2	Community Participation In Flood Disaster Mitigation In Solok Selatan	D. Fitriani and O. Oktorie	2019	Science and Environmental Journals Vol. 1 No. 2 (pp. 1-9) June 2019 ,Vol. 1, no. 2, pp. 1–9, 2019.
3	Community Attitudes and Behavior and Its Influence toward Social Impacts of Flood in Tondano River Estuary, Indonesia	Marthen Kumajas, Zaenal Kusuma, Kliwon Hidayat, and Jailani	2012	International Journal of Civil & Environmental Engineering IJCEE-IJENS Vol:12 No:04
4	The Effect Of Land Use And Community Participation On Flood Control At North Aceh District	Husain S. Lubis	2013	Indonesian Journal of Geography, Vol 45, No.2, December 2013 : 171 - 186
5	People Participation in Flood Disaster Risk Reduction in DesaTanjung Sari District of North Cikarang Bekasi	Sony Nugratama H	2016	1st International Conference on Geography and Education (ICGE 2016)
6	Implementation Of Flood Disaster Mitigation Policy Community-Based In Cilacap Regency, Central Java, Indonesia	Rudi Subiyakto Sri Suwtri EndangLarasati Prayitno	2019	Prizren  Social Science Journal, Volume 3,issue 2,2019
7	Perceptions and adaptation strategies of the community against flood risk at the estuary riverbank of Bone River, Gorontalo Province	S Maryati, S Era.M Kasim	2019	1st International Conference on Global Issue for Infrastructure, Environment & Socio-Economic Development 30 August to 1 September 2018, Makassar, Indonesia.
8	Community Participation on Flood Management in Hulu Sungai Tengah District South Kalimantan Province	A. Nafarin, S. Adyatma, D. Arisanty	2017	Journal Social. Anthropology, vol. 5 no. 5, pp. 399–403, 2017.
9	Community Participation Helps Government in Flood Disaster Management in Jakarta	DewiSulistiyani	2016	Scientific Research Journal (SCIRJ), Volume IV, Issue VIII, August 2016 45 ISSN 2201-2796

### 3.1 Meta Analysis Based on Population of Research Samples

The population in these studies is the community and community groups with a sample taken between 6-380 people and 3 community groups living in flood hazard areas. It's just that there are 3 studies in the journal that do not include the number of samples used. For more details can be seen in the following Tables 2 and 3.

**Table 2.** Respondents

Number	Respondents	Frequency	Percentage
1	Community	8	88,8 %
2	Community group amount	1 9	11,2 % 100%

**Table 3.** Amount of samples

Number	Amount Of Samples	Frequency	Percentage
1	6	1	11,2 %
2	3 groups	1	11,2 %
3	125-380 people	4	44,4 %
4	Does not specify the amount amount	3 9	33,2 % 100%

### 3.2. Meta Analysis Based on Research Design

The research design used in the studies reviewed uses qualitative descriptive, quantitative and comparative designs. For more details, see the following Table 4.

**Table 4.** Research Designs

Number	Research Designs	Frequency	Percent
1	Qualitative descriptive	7	77,8%
2	Quantitative	1	11,1%
3	Comparative amount	1 9	11,1% 100%

### 3.3 Meta Analysis Based on Data Collection Techniques

Data collection techniques for all research used questionnaires and in-depth interview techniques. Questionnaires were chosen because it is appropriate in expressing the opinions or responses of individuals, both individually and in groups to the problem. It can be distributed to large numbers of respondents with a relatively short period. with a fast time.

**Tabel 5.**Data collection Techniques

Number	Data collection techniques	Frequency	Percent
1	Deep interview	3	33,33 %
2	Questionnaire amount	6 9	66,67 % 100 %

### 3.4 Meta-analysis Based on data analysis techniques

Data analysis techniques used in these studies include product-moment correlation, percentage, and frequency distribution, descriptive, SWOT analysis and SEM. Based on a study of 8 studies of community participation, the analysis techniques used are shown in the table below.

**Table 6.** Data technique analysis

Number	Data Technique	Frequency	Percentage
1	Product Moment Correlation	1	11,2 %
2	Percentage and frequency distribution	2	22,2 %
3	Descriptive	4	44,4 %
4	SWOT	1	11,1 %
5	SEM	1	11,1 %
	amount	9	100%

### 3.5. A meta-analysis of Community Active and Non-Active Participation

Participation aims to find better solutions to problems in a community by opening more opportunities for the community to contribute to the implementation of activities that are more effective, efficient and sustainable. How much active community participation in flood preparedness in various regions in Indonesia based on these studies can be seen in Table 7 below.

**Table 7.** Community Active and Non-Active Participation

No	Research area	Percentage of active participation	Percentage of passive participation
1	Tondano, North Sulawesi	48%	52%
2	South Kalimantan	60,78%	39,22%
3	Cikarang, Bekasi	40%	60%
4	Aceh	43%	57%
5	Cilacap, Central Java	40%	60%
6	Gorontalo, North Sulawesi	37,73%	62,27%
7	Sumbawa, West Nusa Tenggara	100%	0%
8	Solok, West Sumatra	100%	0%
9	Dki Jakarta	61,72%	38,28%

### 3.6. Meta Analysis of Forms of Community Participation

The forms of community participation that have been carried out in several regions in Indonesia are shown in Table 8

### 3.7. A meta-analysis of the Effectiveness of Community Participation

Indicators of effectiveness are said to be effective if more than or equal to 50% of the community actively participates in carrying out forms of participation. While said to be ineffective if the active participation is less than 50% seen from the percentage of participation in table 7. Effectiveness was shown in Table 9.

**Table 8.** Forms of Community Participation in the Field

No	Research Area	Participation form
1	Tondano, North Sulawesi	1. explain, 2. supervise and reprimand 3. report to the government if there is damage to the river area
2	South Kalimantan	1. Provide energy assistance, 2. money aid
3	Cikarang, Bekasi	1. Urgent people not to throw garbage to the river bank and in the environment 2. Hold a weekly meeting every Thursday 3. Clean Friday event

4	Aceh	<ol style="list-style-type: none"> <li>1. maintaining flood infrastructures, such as by not dumping waste into rivers or channels, cleaning drains,</li> <li>2. community involvement in flood management planning,</li> <li>3. community involvement in overseeing the implementation of infrastructure development</li> </ol>
5	Cilacap, Central Java	<ol style="list-style-type: none"> <li>1. Socialization, education,</li> <li>2. Disaster training for teenagers</li> <li>3. Disaster information</li> </ol>
6	Gorontalo, North Sulawesi	<ol style="list-style-type: none"> <li>1. determine the location of the evacuation and storage of important documents.</li> <li>2. implementing physical adaptation strategies including increased flooring to build a two-story house, and</li> <li>3. build additional obstacles on the terrace</li> </ol>
7	Sumbawa, West Nusa Tenggara	<ol style="list-style-type: none"> <li>1. Utilize private sector support</li> </ol>
8	Solok, West Sumatra	<ol style="list-style-type: none"> <li>1. to clean their house,</li> <li>2. burning trash.</li> <li>3. Planting trees along the river</li> <li>4. arrange the order of the contents of the house such as the arrangement of beds raised, then propped up with one stone.</li> <li>5. At a time of high rainfall, people save valuables,</li> </ol>
9	Dki Jakarta	<ol style="list-style-type: none"> <li>1. forms of ideas, funds, labor, and tangible or intangible goods,</li> <li>2. installation of a water pump,</li> <li>3. expansion of green open space</li> </ol>

**Table 9.** Effectiveness of Community Participation

Numbe r	Wilayah Penelitian	Effective	Not Effective
1	Tondano, North Sulawesi	*	
2	South Kalimantan	*	
3	Cikarang, Bekasi		*
4	Aceh		*
5	Cilacap, Central Java		*
6	Gorontalo, North Sulawesi		*
7	Sumbawa, West Nusa Tenggara	*	
8	Solok, West Sumatra	*	
9	Dki Jakarta	*	

Data search is based on the internet, it has the potential to collect data. Meta-analysis shows that from the nine studies examined, the sample population is the community around the flood disaster. Three articles do not mention the number of samples. This condition shows the weakness of the article, where it should be, an article must include the sampling technique used and the number of samples taken so that the research carried out is clear and measurable. Research that does not include a sample is in the research perceptions And Adaptation Strategies Of The Community Against Flood Risk At The Estuary Riverbank Of Bone River, Gorontalo Province, Implementation Of Flood Disaster Mitigation Policy Community-Based In Cilacap Regency, Central Java, Indonesia, Community Participation In Flood Disaster Mitigation In Solok Selatan Regency-Indonesia. Determination of the sample greatly determines the success of the research objectives, so that if the sample is done carelessly or even not raised in a study then, of course, the research objectives will not be achieved. For descriptive research, the minimum sample is 10% - 20% of the population. For correlation research at least 30 subjects. For experimental research, at least 30 people per group, for collaborative research, the minimum sample is 30 people. Whereas for comparison, at least 10 people in each group are needed [19]. A good sample requirement is to be accurate and precise. Accurate means that the sample must have accuracy so that data refraction does not occur. Precision means a low level of estimation error because essentially no sample truly represents the entire population. High or low level of precision is indicated by the size of the standard error of estimate means the smaller the estimated standard error indicates the higher level of sample precision. The entire sample in these studies already has the right precision and accuracy because it is taken from 10-20% of the population.

The design of the study uses more descriptive qualitative. This design is indeed appropriate to be able to obtain in-depth information from research subjects, especially the public. Qualitative try to understand the environment as a whole and ultimately help others get a better understanding of how the subjects involved see what happens in certain situations in everyday life [20]. Data collection techniques using questionnaires with data analysis techniques in the form of descriptive.

The results of the study are known that the community in some areas, especially in North Sulawesi, are still doing household activities related to sanitation in the river such as washing clothes in the river, the existence of toilets in the river, disposing of trash in landfills on the river bank, in addition to cattle farming, it is also done on the river bank. (Sulawesi). In other regions such as in Aceh, the cause of the flooding is due to meandering rivers so that the flow rate is low, the capacity of the river to flow water is much smaller than the amount of discharge, change of forests into agricultural and residential land, illegal logging. Cikarang, the cause of the flood was partly due to the overflow of the Cibereum river due to continuous rain, poor drainage, and the river in the village was quite narrow so that the water quickly overflowed. Sumbawa experienced a flood because of the greater number of rainy months than the dry month and made the watershed a source of agriculture. The cause of flooding in West Sumatra was rainfall with high intensity causing river overflowing.

From the causes of floods that arise it can be said that in developing countries, especially Indonesia, flood disasters are not solely due to climate change but are also caused by river conditions and human activities. This is confirmed by research conducted by Yoshihiro who stated that developing countries are very vulnerable to flooding due to inadequate funds, inadequate infrastructure, delays in implementing steps to climate change and efforts to deal with floods, ongoing poverty, and economic conditions unstable [21]. In developing countries generally people affected by flooding do not get insurance, people depend on compensation from the government. Such conditions are certainly very alarming [22].

From these causes, it is necessary to take preparedness efforts in dealing with floods. Preparedness efforts cannot be made solely by the government, government policies or structural mitigation. But it must also seek preparedness through non-structural mitigation efforts. Non-structural mitigation is to involve direct community participation. The higher the community participation in flood hazard preparedness, the lower the impact of flooding and vice versa.

Forms of community participation for effective flood disaster preparedness are in North Sulawesi, Sumbawa, Solok and DKI Jakarta, Kalimantan. While ineffective forms of participation were in



Cikarang, Bekasi, Aceh, Cilacap, Gorontalo. More effective forms of Indonesian people's participation in flood preparedness. This effectiveness is due to the participation of the people of Indonesia is a form of solidarity in the form of energy, money, education, physical building repairs, and tree planting efforts. The high level of community participation in dealing with floods in Indonesia shows that the public's knowledge about the dangers of flooding is getting higher, the government provides the broadest opportunity for the community to actively participate in each program, both from the government and non-government organizations themselves. If there are still some areas where community participation is not effective this is because the level of participation is only at the consultation level. In some activities, it is still at the level of knowledge information, not yet involved as a whole in the planning and implementation of flood management development in each area.

#### 4. Conclusion

Preparedness to deal with floods with the approach of community participation (nonstructural) is very necessary for the regions in Indonesia. Forms of Indonesian people's participation in dealing with floods include in the form of, money, energy, inter-community education, supervision of infrastructure development and the addition of green open spaces. Community participation in several regions of Indonesia is effective because more than 50% of the community is actively involved in preparedness efforts dealing with floods. The government must actively involve the community in flood mitigation planning.

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