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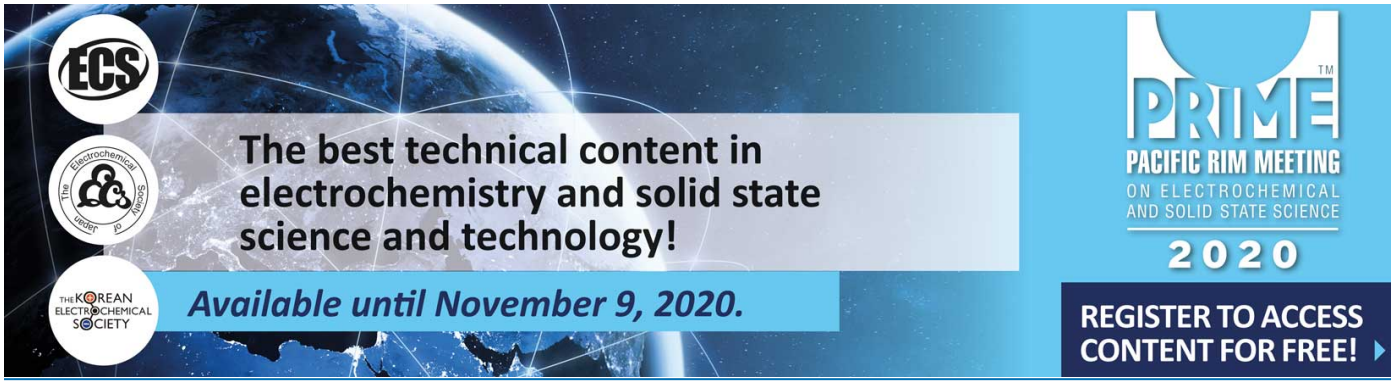

Socio-economic vulnerability and losses of flood in Lampung, Indonesia

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Abstract. This study aims to determine the distribution of flood locations and the level of socio-economic vulnerability of the community and total losses due to flood disasters in Lampung, Indonesia. Climate change causes extreme weather. Thus, the rainfall increases from the previous year. This study utilizes the Livelihood Vulnerability Index (LVI) and Livelihood Vulnerability Index - the Intergovernmental Panel on Climate Change (LVI-IPCC) to determine socio-economic vulnerability. The losses due to flood were analyzed by the ECLAC method (the Economic Commission for Latin America Caribbean). The level of vulnerability of the Lampung community to flood is expected to be classified as high based on the LVI and LVI-IPCC scales. The community suffered economic losses due to flood that occurred in Lampung.

1. Introduction

Climate change is a huge threat to human survival. IPCC research [1] states that the Southeast Asian Region including Indonesia is affected by climate change which increases threats to food security, human health, water availability, and the rise of sea-level. The increasing rainfall occurs in Indonesia and Papua New Guinea. While decreases in rainfall occurred in Thailand, Laos, Myanmar, Cambodia, and Vietnam by 10-20% in March-May. Climate change occurs not only based on natural factors but also caused by human activities that cause an increase in the concentration of Greenhouse Gases (GHGs). This is known as the greenhouse effect or the phenomenon of global warming. This phenomenon increases the amount of water content in the atmosphere which lead to the increasing rainfall. The changes in rainfall patterns indicates climate change [2].

Changes in rainfall increase hydrometeorological disasters that cause flood. Some areas of Indonesia experienced floods, one of the areas was in Lampung Province. According to the National Disaster Management Agency (BNPB), in 2019 flood occurred in many areas. The flood resulted in moderate to severe losses. Communities affected by flood experience vulnerability on the social demographic, economic, health, food, and watersides.

Flood disasters cause the weakening of the economy of a society and the global economy. The calculation of damage and losses due to flood disasters is not yet reflected in the actual figures [3]. Based on the description above, it is necessary to calculate the vulnerability index of the livelihoods of people affected by flood due to climate change along with the losses and experienced damage, so this study aim to determinate the distribution of flood locations and the level of socio-economic vulnerability of the community and total losses due to flood disasters in Lampung, Indonesia.

2. Methodology

2.1. Research location

This study utilizes survey to collect the data. There are 21 units from 8 sub-districts in Pringsewu District that were selected as survey areas. These districts include Pringsewu, Gadingrejo, Ambarawa, Pardasuka, Sukoharjo, Adiluwih, North Pagelaran, and Banyumas.

2.2. Type of research

This research utilizes a quantitative descriptive approach.

2.3. Data source

This study utilize primary data from 156 respondents and secondary data generated from the Regional Disaster Management Agency (BPBD) of Pringsewu Regency and the Central Statistics Agency (BPS) of Pringsewu Regency.

2.4. Data analysis and methods

2.4.1. Livelihood Vulnerability Index (LVI). This study utilizes the calculation of the Livelihood Vulnerability Index (LVI) to determine the vulnerability index due to flood that caused by climate change and changes in rainfall patterns. The livelihood vulnerability index (LVI) was developed by Hahn et al. [4] by using several components. These components include socio-economic demographics, livelihood strategies, health, social networks, food, water, natural disasters, and climate variability [5]. The sub-components of each main component are as follow:

- Socio-economic Demographics: dependency rates, pecentage of female household heads, percentage of households that need assistance, monthly expenditure.
- Livelihood Strategies: the percentage of households whose family members work outside the city, the percentage of households that depend their lives on the agricultural sector as the main source of income, the average of the agricultural diversification index.
- Health: how long it takes to go to a health facility, household members who have chronic illnesses.
- Social Networks: average receiving compared to the ratio of giving, the average ratio of borrowing and lending money, households applying for assistance to the government.
- Food: the percentage of households that depend on agriculture as their main food source, the average number of households experiencing food shortages, the average household that stores food crops.
- Water: the percentage of households that use natural water sources, the average travel time to get water, the percentage of households that have a water supply, as opposed to the average number of liters of water stored per household.
- Natural disasters and climate variability: the average month of rain in a year, the percentage of households without climate warning, the percentage of households experiencing losses due to climate change, standard deviations from the average daily maximum temperature for five years , the standard deviation of the average daily minimum temperature for five years, and the standard deviation of the average monthly rainfall.

The LVI component developed by Hahn et al. [4] consists of several indicators or sub-components. Sub-components are developed based on the results of a literature review of each of the main components. LVI value in this study was calculated using the balanced weighted averaged approach. Each sub-component has the same contribution to the overall index, although the number of sub-components in each component is different [6].

The composite index approach obtained from UNDP, *the life expectancy index* is utilized to convert the scale of each sub-component, [7]. The equation of the sub-components as follows:

$$Index\,Sb = \frac{Sb - Smin}{Smax - Smin} \quad \text{..... (1)}$$

Variable specification:
Sb = regional component value b
Smin = minimum value of each sub-component
Smax = maximum value of each sub-component

After standardizing, then calculating the average value using the formula Hahn et al. [4] to calculate the value of the main components.

$$Mb = \frac{\sum_1^n Index_b i}{n} \quad \text{..... (2)}$$

Variable specification:
Mb = One of the main components of area b (SDP, LS, H, F, W, SN, and ND)
$Index_b i$ = value of sub-components indexed by i.

LVI values are obtained from the following equation:

$$LVI_b = \frac{\sum_{i=1}^{7} W_M i_M b}{\sum_{i=1}^{7} W_M i} \quad \text{..... (3)}$$

Variable specification :
LVI_b = region b vulnerability index weighted by the main component.
W_{Mi} = number of sub-components that reflect each major component and have the same contribution to the overall LVI.

LVI scale classification
- Value 0 - 0.2 = not vulnerable
- Value 0.21 - 0.4 = vulnerable / moderate
- 0.41-0.5 = very vulnerable

2.4.2. LVI IPCC approach (Livelihood Vulnerability Index - Intergovernmental Panel of Climate Change). This study employed LVI - IPCC approach to calculate LVI based on the understanding of vulnerability according to the IPCC. Exposure is measured based on the natural disaster and climate variability component. Adaptive capacity is measured by socio-economic demographics, livelihood strategies, and social networks. Sensitivity is measured by determining the availability of food, water, and health.

$$CF_d = \frac{\sum_{i=1}^{n} W_{Mi} M_{di}}{\sum_{i=1}^{n} W_{Mi}} \quad \text{..... (4)}$$

Variable specification:
CF_d = contribution of IPCC
M_{di} = the main component for region d indexed by i.
WMi = the weight of the main component
n = number of main components

The combination of these three contributions is calculated using the following equation :

$$LVI - IPCC_d = (e_d - a_d) * S_d \quad \text{..... (5)}$$

Variable specification :
LVI - $IPCC_d$ = LVI IPCC Index
e_d = exposure score
a_d = adaptation capacity
s_d = sensitivity score

The grouping of categories are: the value of -1–(-0.4) classified as not vulnerable, the value of (-0.41)–0.3 is stated as moderate, and the value of 0.31–1 is considered very vulnerable.

2.4.3. ECLAC (Economic Commission for Latin America and Carribean) calculation
Disaster loss calculation ECLAC analyzes each sector for damage and losses [8]. The calculation of each sector is used to ensure consistency of information. Thus, there is no duplication and comparison of results and additions from calculations per sector.

According to this method, the main sectors are divided into 5 (five) sectors namely housing, infrastructure, social, economic, and cross-sectoral.

3. Result and discussion

3.1. Livelihood Vulnerability Index (LVI)
Based on data processed from 156 respondents, it can be seen that the people of Pringsewu Regency are included in the vulnerable category, with an index of 0.329. Calculations can be found in Table 1.

Table 1. Sub-component composite index, and main component index.

Sub component	Composite Index sub-component	Main Components	Main Component Index	Category
Dependency figure	0.258	Socio- Economic Demographics	0.303	Vulnerable
Percentage of female family heads	0.096			
The average age of a female family head	0.483			
The average expenditure a month	0.376			
Percentage households with members of the family who worked in outside cities	0.250	Livelihood strategy	0.331	Vulnerable
Percentage households are a source of income main from agriculture	0.724			
Average index of classification of agricultural sector livelihoods (0.20-1)	0.020			
The average time that is taken to the facility health	0.077	Health	0.147	Not Vulnerable
The percentage of households whose family members have chronic diseases	0.218			
Average receive: give ratio (range 0.5-2)	0.368	Social network	0.429	Very Vulnerable
Average borrowing money ratio: lending money	0.632			
The percentage of households who submitted assistance to the local government	0.288			
Percentage households are a source of food comes from the own agriculture land	0.763	Food	0.324	Vulnerable

Sub component	Composite Index sub-component	Main Components	Main Component Index	Category
The average number of months a household has difficulty eating	0.004			
Percentage households that did not save the results of the harvest	0.205			
Percentage households which utilize sources of water natural	1.000	Water	0.284	Vulnerable
The average time that it takes to lead to the source of water	0.017			
Percentage of households that do not have a consistent water supply	0.115			
The opposite of the average amount of water in liters are saved per home stairs	0.003			
The average number of rainy months in a year	0.324	Natural disasters and climate variability	0.484	Very Vulnerable
Percentage of households that did not receive a warning about a disaster coming	0.846			
Percentage of households that feel lost due to climate change	0.641			
Rated average standar deviation of the average temperature of the air maximum per month	0.289			
The average value of the standard deviation of the average minimum air temperature per month	0.380			
The average value of the standard deviation of the average rainfall per month	0.423			
		LVI Value	0.329	Vulnerable

Based on Table 1, Health components is considered not vulnerable, because based on primary data, the distance of the respondent's residence is close to the health facility. Socio-economic demographics, livelihood strategies, food, and water components are considered as vulnerable. While the components that are categorized as very vulnerable are social networks, natural disasters, and climate variability. It is caused by erratic weather changes that cause some problems in their work example in agriculture which is the main commodity.

3.2. LVI-Intergovernmental Panel Climate Change (LVI-IPCC)

LVI-IPCC is an alternative method developed from the Livelihood vulnerability index (LVI). LVI-IPCC is used to make allegations of community livelihood vulnerability relative to the effects of climate change.

Based on Table 2, the results show a value of 0.036 which means that the people of Pringsewu District have a moderate vulnerability to climate change. It is because the value within 0.21 – 0.40 classified to vulnerable. Vulnerability calculation is an effort to carry out risk management. Disaster risk management is important to minimize disaster losses.

Table 2. Calculation of LVI-IPCC contributing factor values

IPCC contribution factors	Main component	Weight	The contribution factor value	Category
Adaptation Capacity		**10**	**0.349**	**Very vulnerable**
	Socio-demographic economy	4	0.303	
	Livelihood strategy	3	0.331	
	Social network	3	0.429	
Sensitivity		**9**	**0.269**	**Very vulnerable**
	Health	2	0.147	
	Food	3	0.324	
	Water	4	0.284	
Exposure		**6**	**0.484**	**Very vulnerable**
	Natural disasters and climate variability	6	0.484	
LVI-IPCC			**0.036**	**Vulnerable**

3.3. ECLAC Result

3.3.1. The Pringsewu Regency flood incident. According to information generated from the Regional Disaster Management Agency (BPBD) of Pringsewu Regency, the location of the flood disaster occurred in the North Pagelaran, Ambarawa, Pringsewu, Gadingrejo, Pardasuka, Banyumas, Adiluwih, and Sukoharjo. The flood was identified as being caused by high rainfall for more than 10 hours. Hilly conditions are crushed so that there are no trees to absorb water [9]. Human activities such as the behavior of littering also cause irrigation to clog up, causing blockages in the waterways. A total of 6 (six) people were slightly injured and no fatalities.

3.3.2. Macro condition Pringsewu Regency. Pringsewu Regency economy is based on agriculture, forestry and fisheries sectors. Table 3 show that Gross Regional Domestic Product (GRDP) based on the constant 2010 prices according to the business sector was recorded at 1.8 trillion rupiahs, or equivalent to 25 percent of total GRDP [10].

Almost all Sub-districts in Pringsewu District were flooded in early 2019. Sub-districts in Pringsewu Regency have altitudes between 99.5 and 150 above sea level [10]. The average elevation above sea level (DPL) of the sub-district in the Pringsewu Regency is 126.82 MDPL. With these heights, it is potentially affected by floods when rainfall increases due to climate change. Gadingrejo sub-district has the lowest altitude, which is 99.97 MDPL.

Table 3. GDRP at constant 2010 prices according to the business field in 2016-2018

Business Field	GRDP Upper Basic Price Constant According to Field Enterprises (Million Rupiahs)			Average	Contributions (%)
	2016	2017	2018		
Agriculture, Forestry, and Fisheries	1,722,999.8	1,773,311.0	1,806,295.7	1,767,535.5	25.2
Mining and Quarrying	6,432.3	7,015.6	7,505.8	6,984.5	0.1
Processing Industry	986,442.9	1,042,624.9	1,107,464.4	1,045,510.7	14.9
Electricity and Gas Procurement	4,719.1	5,098.2	5,430.4	5,082.6	0.1
Procurement Water, Management of Waste, Waste and Recycling	3,512.6	3,663.7	3,776.9	3,651.1	0.1
Construction	814,068.8	856,058.5	910,960.9	860,362.7	12.3
Trade Large and Retail; Repair Car and Motorcycle	1,015,609.4	1,075,857.6	1,142,348.0	1,077,938.3	15.3
Transportation and Warehousing	290,692.7	310,785.1	332,067.2	311,181.6	4.4
Provision of accommodation and Eat Drink	145,129.3	154,553.2	169,311.9	156,331.5	2.2
Information and Communication	358,767.3	393,864.8	426,213.0	392,948.4	5.6
Financial Services and Insurance	277,375.3	285,412.2	289,565.6	284,117.7	4.0
Real estate	274,706.0	293,194.2	304,038.8	290,646.3	4.1
Services Company	15,738.9	16,638.1	16,893.8	16,423.6	0.2
Government Administration , Defense and Mandatory Social Security	253,370.8	262,816.6	273,871.9	263,353.1	3.8
Educational Services	337,923.2	357,280.0	382,724.3	359,309.2	5.1
Health Services and Social Activities	98,101.5	102,419.1	107,855.5	102,792.0	1.5
Others Services	71,758.8	78,105.7	85,289.9	78,384.8	1.1
TOTAL	**6,677,349**	**7,018,698**	**7,371,614**	**7,022,554**	**100**

Source: [10]

3.3.3. Damage and losses due to flood disaster. The loss and damage from the flood disaster in Pringsewu District reached Rp. 12.3 M. Based on Table 4, each sector, the biggest damage and loss is in the main economic sector that is rice subsector. As many as 4.5 percent of the total rice fields in the Pringsewu District were flooded and experienced crop failure. Agriculture sub-sector, in this case rice farmers suffer losses when there is a flood. Floods cause the newly planted rice plants to be submerged so that the estimated harvest period is also getting longer.

Based on BPBD, the amount of loss is based on the estimated results immediately after the disaster. In the infrastructure sector, damaged subsector is a broken bridge. The bridge connects the Nusa Wungu Pekon with Way Krui in Banyumas District. The health sector has one unit of damage data, namely the paramedic house of the Wates Puskesmas in Gadingrejo District. Furthermore, damage and losses in the livestock sector were 0.5 percent and the fisheries sub-sector was 0.11 percent. The damage and loss calculation is still relatively low at 0.16 percent of the GRDP. However, if the government does not make a policy to manage disasters such as mitigation, with calculated vulnerabilities, the likelihood of flood losses will be higher.

Table 4. Accumulated damage and losses calculated by ECLAC method

No	Main sector	Sub-sector	Estimated damage		Estimated loss		Total	
			(Rp)	(%)	(Rp)	(%)	(Rp)	(%)
1	Housing	Housing	335,000,000.00	2.74	-	-	335,000,000.00	2.71
		Environmental Infrastructure	-	-	-	-	-	-
2	Infrastructure	Transportation (bridge)	250,000,000.00	2.04	-	-	250,000,000.00	2.02
3	Social	Health	2,000,000.00	0.02	-	-	2,000,000.00	0.02
		Education (School)	95,000,000.00	0.78	-	-	95,000,000.00	0.77
4	The economy	Rice fields	11,540,000,000.00	94.32	65,000,000.00	50.41	11,605,000,000.00	93.87
		Fishery	-	-	63,000,000.00	48.86	63,000,000.00	0.51
		Animal husbandry	12,500,000.00	0.10	950,000.00	0.74	13,450,000.00	0.11
5	Cross Sectoral	Government offices	-	-	-	-	-	-
		Total	**12,234,500,000.00**	**100.00**	**128,950,000.00**	**100.00**	**12,363,450,000.00**	**100.00**

Source : BPBD Pringsewu Regency 2019

4. Conclusion

According to Livelihood Vulnerability Index-Intergovernmental Panel of Climate Change (LVI-IPCC) and ECLAC calculation, Pringsewu regency have vulnerability due to climate change. The disaster caused by climate change can increase the number of losses.

References

[1] Bernstein L, Bosch P, Canziani O, Chen Z, Christ R, Davidson O, Hare W, et al. 2008 *Climate change 2007: Synthesis report: An assessment of the intergovernmental panel on climate change* (Geneva, Switzerland : IPCC)
[2] Suripin S and Kurniani D 2016 *Media Komunikasi Teknik Sipil* **22** 119–28
[3] Madjid N C 2018 *Simposium Nasional Keuangan Negara* **1** 1046–65
[4] Hahn M B, Riederer A M and Foster S O 2009 *Global Environmental Change* **19** 74–88
[5] Gravitiani E and Fitriana S N 2018 *IOP Conference Series: Earth and Environmental Science (Surakarta)* vol 202 (United Kingdom: IOP Publishing) 012050
[6] Sullivan C A, Meigh J R and Fediw T S 2002 *Derivation and testing of the water poverty index phase 1. Final Report May 2002* (Wallingford: Centre for Ecology and Hydrology) pp 603
[7] Khoday K 2007 Climate change and the right to development. Himalayan glacial melting and the future of development on the Tibetan *Plateau Human Development Report Office (HDRO)* No. HDOCPA-2007-28 (New York, Amerika: UNDP)
[8] B3P 2008 *Penilaian kerusakan dan kerugian* (Jakarta, Indonesia: Bappenas)
[9] Syarifah E, Haryono E and Miswar D 2019 *JPG (Jurnal Penelitian Geografi)* **7** 5 (p 18)
[10] BPS 2018 *Kabupaten Pringsewu dalam angka* (Pringsewu, Indonesia: BPS)

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Introduction

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The average expenditure a month	0.376			
Percentage households with members of the family who worked in outside cities	0.250	Livelihood strategy	0.331	Vulnerable
Percentage households are a source of income main from agriculture	0.724			
Average index of classification of agricultural sector livelihoods (0.20-1)	0.020			
The average time that is taken to the facility health	0.077	Health	0.147	Not Vulnerable
The percentage of households whose family members have chronic diseases	0.218			
Average receive: give ratio (range 0.5-2)	0.368	Social network	0.429	Very Vulnerable
Average borrowing money ratio: lending money	0.632			
The percentage of households who submitted assistance to the local government	0.288			
Percentage households are a source of food comes from the own agriculture land	0.763	Food	0.324	Vulnerable

Sub component	Composite Index sub-component	Main Components	Main Component Index	Category
The average number of months a household has difficulty eating	0.004			
Percentage households that did not save the results of the harvest	0.205			
Percentage households which utilize sources of water natur	1.000	Water	0.284	Vulnerable
The average time that it takes to lead to the source of water	0.017			
Percentage of households that do not have a consistent water supply	0.115			
The opposite of the average amount of water in liters are saved per home stairs	0.003			
The average number of rainy months in a year	0.324	Natural disasters and climate variability	0.484	Very Vulnerable
Percentage of households that did not receive a warning about a disaster coming	0.846			
Percentage of households that feel lost due to climate change	0.641			
Rated average standar deviation of the average temperature of the air maximum per month	0.289			
The average value of the standard deviation of the average minimum air temperature per month	0.380			
The average value of the standard deviation of the average rainfall per month	0.423			
		LVI Value	0.329	Vulnerable

Based on Table 1, Health components is considered not vulnerable, because based on primary data, the distance of the respondent's residence is close to the health facility. Socio-economic demographics, livelihood strategies, food, and water compone are considered as vulnerable. While the components that are categorized as very vulnerable are social networks, natural disasters, and climate variability. It is caused by erratic weather changes that cause some problems in their work example in agriculture which is the main commodity.

3.2. LVI-Intergovernmental Panel Climate Change (LVI-IPCC)

LVI-IPCC is an alternative method developed from the Livelihood vulnerability in x (LVI). LVI-IPCC is used to make allegations of community livelihood vulnerability relative to the effects of climate change.

Based on Table 2, the results show a value of 0.036 which means that the people of Pringsewu District have a moderate vulnerability to climate change. It is because the value within 0.21 – 0.40 classified to vulnerable. Vulnerability calculation is an effort to carry out risk management. Disaster risk management is important to minimize disaster losses.

Table 2. Calculation of LVI-IPCC contributing factor values

IPCC contribution factors	Main component	Weight	The contribution factor value	Category
Adaptation Capacity		**10**	**0.349**	**Very vulnerable**
	Socio-demographic economy	4	0.303	
	Livelihood strategy	3	0.331	
	Social network	3	0.429	
Sensitivity		**9**	**0.269**	**Very vulnerable**
	Health	2	0.147	
	Food	3	0.324	
	Water	4	0.284	
Exposure		**6**	**0.484**	**Very vulnerable**
	Natural disasters and climate variability	6	0.484	
LVI-IPCC			**0.036**	**Vulnerable**

3.3. ECLAC Result

3.3.1. The Pringsewu Regency flood incident. According to information generated from the Regional Disaster Management Agency (BPBD) of Pringsewu Regency, the location of the flood disaster occurred in the North Pagelaran, Ambarawa, Pringsewu, Gadingrejo, Pardasuka, Banyumas, Adiluwih, and Sukoharjo. The flood was identified as being caused by high rainfall for more than 10 hours. Hilly conditions are crushed so that there are no trees to absorb water [9]. Human activities such as the behavior of littering also cause irrigation to clog up, causing blockages in the waterways. A total of 6 (six) people were slightly injured and no fatalities.

3.3.2. Macro condition Pringsewu Regency. Pringsewu Regency economy is based on agriculture, forestry and fisheries sectors. Table 3 show that Gross Regional Domestic Product (GRDP) based on the constant 2010 prices according to the business sector was recorded at 1.8 trillion rupiahs, or equivalent to 25 percent of total GRDP [10].

Almost all Sub-districts in Pringsewu District were flooded in early 2019. Sub-districts in Pringsewu Regency have altitudes between 99.5 and 150 above sea level [10]. The average elevation above sea level (DPL) of the sub-district in the Pringsewu Regency is 126.82 MDPL. With these heights, it is potentially affected by floods when rainfall increases due to climate change. Gadingrejo sub-district has the lowest altitude, which is 99.97 MDPL.

Table 3. GDRP at constant 2010 prices according to the business field in 2016-2018

Business Field	GRDP Upper Basic Price Constant According to Field Enterprises (Million Rupiahs)			Average	Contributions (%)
	2016	2017	2018		
Agriculture, Forestry, and Fisheries	1,722,999.8	1,773,311.0	1,806,295.7	1,767,535.5	25.2
Mining and Quarrying	6,432.3	7,015.6	7,505.8	6,984.5	0.1
Processing Industry	986,442.9	1,042,624.9	1,107,464.4	1,045,510.7	14.9
Electricity and Gas Procurement	4,719.1	5,098.2	5,430.4	5,082.6	0.1
Procurement Water, Management of Waste, Waste and Recycling	3,512.6	3,663.7	3,776.9	3,651.1	0.1
Construction	814,068.8	856,058.5	910,960.9	860,362.7	12.3
Trade Large and Retail; Repair Car and Motorcycle	1,015,609.4	1,075,857.6	1,142,348.0	1,077,938.3	15.3
Transportation and Warehousing	290,692.7	310,785.1	332,067.2	311,181.6	4.4
Provision of accommodation and Eat Drink	145,129.3	154,553.2	169,311.9	156,331.5	2.2
Information and Communication	358,767.3	393,864.8	426,213.0	392,948.4	5.6
Financial Services and Insurance	277,375.3	285,412.2	289,565.6	284,117.7	4.0
Real estate	274,706.0	293,194.2	304,038.8	290,646.3	4.1
Services Company	15,738.9	16,638.1	16,893.8	16,423.6	0.2
Government Administration , Defense and Mandatory Social Security	253,370.8	262,816.6	273,871.9	263,353.1	3.8
Educational Services	337,923.2	357,280.0	382,724.3	359,309.2	5.1
Health Services and Social Activities	98,101.5	102,419.1	107,855.5	102,792.0	1.5
Others Services	71,758.8	78,105.7	85,289.9	78,384.8	1.1
TOTAL	**6,677,349**	**7,018,698**	**7,371,614**	**7,022,554**	**100**

Source: [10]

3.3.3. Damage and losses due to flood disaster. The loss and damage from the flood disaster in Pringsewu District reached Rp. 12.3 M. Based on Table 4, each sector, the biggest damage and loss is in the main economic sector that is rice subsector. As many as 4.5 percent of the total rice fields in the Pringsewu District were flooded and experienced crop failure. Agriculture sub-sector, in this case rice farmers suffer losses when there is a flood. Floods cause the newly planted rice plants to be submerged so that the estimated harvest period is also getting longer.

Based on BPBD, the amount of loss is based on the estimated results immediately after the disaster. In the infrastructure sector, damaged subsector is a broken bridge. The bridge connects the Nusa Wungu Pekon with Way Krui in Banyumas District. The health sector has one unit of damage data, namely the paramedic house of the Wates Puskesmas in Gadingrejo District. Furthermore, damage and losses in the livestock sector were 0.5 percent and the fisheries sub-sector was 0.11 percent. The damage and loss calculation is still relatively low at 0.16 percent of the GRDP. However, if the government does not make a policy to manage disasters such as mitigation, with calculated vulnerabilities, the likelihood of flood losses will be higher.

Table 4. Accumulated damage and losses calculated by ECLAC method

No	Main sector	Sub-sector	Estimated damage		Estimated loss		Total	
			(Rp)	(%)	(Rp)	(%)	(Rp)	(%)
1	Housing	Housing	335,000,000.00	2.74	-	-	335,000,000.00	2.71
		Environmental Infrastructure	-	-	-	-	-	-
2	Infrastructure	Transportation (bridge)	250,000,000.00	2.04	-	-	250,000,000.00	2.02
3	Social	Health	2,000,000.00	0.02	-	-	2,000,000.00	0.02
		Education (School)	95,000,000.00	0.78	-	-	95,000,000.00	0.77
4	The economy	Rice fields	11,540,000,000.00	94.32	65,000,000.00	50.41	11,605,000,000.00	93.87
		Fishery	-	-	63,000,000.00	48.86	63,000,000.00	0.51
		Animal husbandry	12,500,000.00	0.10	950,000.00	0.74	13,450,000.00	0.11
5	Cross Sectoral	Government offices	-	-	-	-	-	-
		Total	**12,234,500,000.00**	**100.00**	**128,950,000.00**	**100.00**	**12,363,450,000.00**	**100.00**

Source : BPBD Pringsewu Regency 2019

4. Conclusion

According to Livelihood Vulnerability Index-Intergovernmental Panel of Climate Change (LVI-IPCC) and ECLAC calculation, Pringsewu regency have vulnerability due to climate change. The disaster caused by climate change can increase the number of losses.

References

[1] Bernstein L, Bosch P, Canziani O, Chen Z, Christ R, Davidson O, Hare W, et al. 2008 *Climate change 2007: Synthesis report: An assessment of the intergovernmental panel on climate change* (Geneva, Switzerland : IPCC)
[2] Suripin S and Kurniani D 2016 *Media Komunikasi Teknik Sipil* **22** 119–28
[3] Adjid N C 2018 *Simposium Nasional Keuangan Negara* **1** 1046–65
[4] Hahn M B, Riederer A M and Foster S O 2009 *Global Environmental Change* **19** 74–88
[5] Gravitiani E and Fitriana S N 2018 *IOP Conference Series: Earth and Environmental Science (Surakarta)* vol 202 (United Kingdom: IOP Publishing) 012050
[6] Sullivan C A, Meigh J R and Fediw T S 2002 *Derivation and testing of the water poverty index phase 1. Final Report May 2002* (Wallingford: Centre for Ecology and Hydrology) pp 603
[7] Khoday K 2007 Climate change and the right to development. Himalayan glacial melting and the future of development on the Tibetan *Plateau Human Development Report Office (HDRO)* No. HDOCPA-2007-28 (New York, Amerika: UNDP)
[8] B3P 2008 *Penilaian kerusakan dan kerugian* (Jakarta, Indonesia: Bappenas)
[9] Syarifah E, Haryono E and Miswar D 2019 *JPG (Jurnal Penelitian Geografi)* **7** 5 (p 18)
[10] BPS 2018 *Kabupaten Pringsewu dalam angka* (Pringsewu, Indonesia: BPS)

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