UNIVERSITAS MUHAMMADIYAH PROF. DR. HAMKA
FAKULTAS KEGURUAN DAN ILMU PENDIDIKAN
Kampus B : Jl. Tanah Merdeka No.20, RT.11/RW.2, Rambutan, Kecamatan Ciracas, Kota Jakarta Timur,
Daerah Khusus Ibukota Jakarta 13830 Telp. (021) 8400341, 8403683, Fax. (021) 8411531
Website : www.fkip.uhamka.ac.id Home page : www.uhamka.ac.id

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The Strategies of Flood Mitigation in Kota Banjar, West Java

Faqqih Ma'ruf Anggoro, Agung Adiputra*, R. Tricahyono Nur Harsono
Pendidikan Geografi Universitas Muhammadiyah Prof. Dr. HAMKA
*agung_adiputra@uhamka.ac.id

Abstract

The flood disaster that occurred in Banjar City was caused by the high intensity of rainfall in each rainy season. The disaster resulted in considerable material and non-material losses. As a result of these impacts, a flood disaster mitigation strategy is needed in Banjar City. Flood disaster mitigation strategies are needed as a form of effort to reduce and manage the risks posed by floods to human health, economic activities, the environment, and cultural heritage. Therefore, this study aims to create a flood disaster mitigation strategy that can be done in Banjar City. This study uses the Analytic Hierarchy Process (AHP) method which aims to obtain weights and determine the priority scale of flood disaster mitigation strategies used. In using this method there are several principles that must be understood in solving problems with AHP, namely decomposition, comparative judgment, synthsesis of priority and logical consistency.The results of the AHP analysis show that regional regulation policy strategies and their implementation (weight 0.195), policy strategies related to coordination between stakeholders (weight 0.185), policy strategies related to disaster risk assessment (weight 0.129), policy strategies related to disaster management funding (weight 0.170), policy strategies related to increasing stakeholder capacity (weight 0.089), strategies for disaster-resilient communities and facilities and infrastructure (weight 0.089), strategies for improving the quality and quantity of human resources (weight 0.085), and strategies for post-disaster recovery (weight 0.059). Based on the results of the AHP analysis, an inconsistensy ratio of 0.014 < 0.1 was obtained, which means that the results of the analysis can be accepted.

Keywords: Mitigation, Flood, The Strategies of Flood Mitigation

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**Corresponding Author*

1. Introduction

A flood is an event that occurs when excessive water flow submerges a land (Salsabila & Nugraheni 2020). Floods in Indonesia are caused by several natural and human factors. Natural factors, namely high rainfall intensity can cause flooding, or human factors include the disposal of garbage in the water stream *(drainage)* so that it can clog the flow of water so that it can potentially flood or due to poor land use. Global

climate change that occurs in Indonesia is one of the factors causing floods in Indonesia. Climate change is causing polar ice to melt which has an impact on rising sea levels. In addition, another impact in Indonesia is the irregular season marked by the phenomenon of Elnino (prolonged dry season) and Lanina, which is rain that occurs continuously (Mardikaningsih,et al, 2017).

The *Lanina* phenomenon is the cause of the high intensity of rainfall in West Java Province (Sutopo 2016). The *Lanina phenomenon* is characterized by the entry of the rainy season (Fadilla, Subiyanto, & Suprayogi 2017). The rainy season results in high intensity rainfall which can result in catastrophic flooding. According to BNPB data, in 2020 West Java was a province in Indonesia that often experienced floods. It was recorded that during 2020, West Java experienced 264 flood events, while for 2021 more than 200 flood events spread throughout cities/regencies in West Java. The incidence of floods increases every rainy season in December, January, and February (Amri et al. 2022). In February 2022, floods that occurred in several cities in West Java were caused by high rainfall. The flood disaster that occurred caused losses to the community (Pemerintah Kota Cimahi 2022). The Regional Disaster Management Agency is expected to be prepared to face flood disasters. Alert status is very necessary, considering that West Java is a disaster-prone area. One of the areas in West Java that often experiences floods is Banjar Kota.

Kota Banjar is one of the areas in West Java that is included in the flood-prone category. This natural disaster always occurs every year when entering the rainy season. In addition to rainfall factors, land use factors and river density in Banjar City are also the causes of flooding. High rainfall intensity as well as poor drainage systems and also uncontrolled land use result in frequent floods. Especially in areas with a high population density, namely residential areas. The flood disaster that occurred in Banjar City resulted in considerable material and non-material losses. Based on the latest data from the Banjar City BPBD, the flood disaster occurred on September 11, 2022, caused by the overflow of the Citanduy river. This flood disaster affected 58 houses on the banks of the Citanduy River, and damaged several facilities and infrastructure (BPBD Kota Banjar 2022).

Based on these problems, a flood disaster mitigation strategy is needed. Flood disaster mitigation strategy is an overall process of planning and implementation in dealing with sudden floods caused by blocked river flows or due to poor land use that has an impact on property losses and causes casualties (Utara 2017). According to (Z. W. Kundzewicz 2018) Flood disaster mitigation strategies are needed as a form of effort to reduce and manage the risks posed by floods to human health, economic activities, the environment, and cultural heritage. There are three different systems needed in carrying out flood disaster mitigation strategies, namely resisting, absorbing, and adapting. The first system in the strategy is to fight back by strengthening structural mitigation, the second system is to absorb by means of spatial planning and disaster management, and the third system is by adapting. The three systems are a combination carried out to carry out flood disaster mitigation strategies.

Kota Banjar Facing significant risks of flooding caused by factors such as high rainfall, sloping topography, and limited drainage capacity. In addition, the existence of the Citanduy River that stretches and divides Banjar City makes it one of the causes of flooding (Mulyatin et al. 2023). Therefore, flood disaster mitigation strategies in Banjar City need to be carried out to reduce the impact caused by flood disasters. According to (Mulyatin et al. 2023) One of the efforts to prevent flooding is to plant trees. This tree planting movement is a movement to prevent flooding and preserve the environment.

However, according to BPBD Kota Banjar (2018) As a first step in anticipating the impact caused by floods, regular cleaning of drainage channels from garbage is needed. The National Disaster Management Agency in the Disaster Management Master Plan explains the policy strategy in overcoming flood disasters. The policy strategy is a mitigation activity from Pre to Post which requires all stakeholders to overcome flood disasters. Therefore, the purpose of this study is to create a flood disaster mitigation strategy that can be done in Kota Banjar, West Java.

2. Methodology

This research is a descriptive research using the Analythic Hierarchy Process (AHP) method. According to Sudamara (2012), AHP is used to solve a problem in an organized frame of mind, so that it can be used for effective decision making. AHP is an adaptive approach that can be utilized for long-term planning by maximizing its policy benefits from each strategy choice (Lessard 2012). This method is used in analyzing data to get decisions. In the process of determining disaster mitigation strategies in Banjar City, AHP is used to analyze the prioritization of alternative policy variables that affect the determination of flood disaster mitigation strategies. Descriptive analysis is used to describe policy variables that can be used as flood disaster mitigation strategies. Research using the AHP method is used to determine the priority of flood disaster mitigation strategies in Banjar City. Meanwhile, the stages to obtain the priority order include four stages, namely problem identification, preparation of questionnaires with pairwise comparison methods, assessment or comparison by disaster pentahelix, and data analysis with AHP.

A. Identify the Problem

Problem identification is based on problems that occur in fact in the field. Based on the identification of these problems, a flood disaster mitigation strategy is needed. Therefore, based on PP No.20 of 2020 concerning the Disaster Management Master Plan, several mitigation policies and strategies that must be carried out in mitigating flood disasters are explained.

Table 1. Flood Disaster Mitigation Policy and Strategy

No	Policy Strategy	Alternative Strategies
1	Strengthening Local Regulations in Effective and Efficient Disaster Management.	Improve the quality of local regulatory tools and implementation in adaptive and sustainable PB.
		Improve the quality of NT norms, standards, procedures, and criteria.
2	Increasing Synergy between Ministries/Institutions and Stakeholders in PBIncreasing Synergy between Ministries/Institutions and Stakeholders in PB.	Improve coordination and cooperation between ministries/agencies, local governments, TNI, Chief of Police, Academics, Business Institutions, Community, Media, and other stakeholders in PB.
		Increasing Synergy between Ministries/Institutions and Stakeholders in PB
3	Strengthening Investment in Disaster Risk Management in accor&ce with Risk Projections by Taking	Implement and develop disaster risk preparedness and management programs by taking into account spatial planning and regional arrangement.
		Increase investment and utilization of various innovative funding schemes including ririco transfers for PB.

	Into Account Spatial Planning and Regional Planning.	Optimize integrated funding for PB.
4	Strengthening PB Governance that is More Professional, Transparent, and Accountable	Increase the capacity and professionalism of PB organizers and actors.
		Optimizing the implementation of minimum service standards for Disaster Management.
		Improve information disclosure and communication, quality of planning systems, and monitoring and evaluation in PB.
		Encourage stakeholder involvement in PB governance to improve accountability.
		Realizing districts/cities, villages/kelurahan, and disaster-resilient communities.
		Realizing facilities and infrastructure that are resilient to disasters.
		Improve disaster education and knowledge management of PB to the community and stakeholders.
5	Strengthening PB Governance that is More Professional, Transparent, and Accountable	Improve the quality and quantity of human resources in disaster emergency management.
		Improve the readiness and reliability of logistics and disaster emergency management equipment.
		Optimizing the management of community assistance in disaster emergency management.
		Strengthening the quality of institutions and strengthening technological knowledge.
		Mempercepat pemulihan sarana & prasarana vital.
6	Accelerate Post-Disaster Recovery in Disaster-stranded Areas and Communities to build a better breathe	Optimizing rehab planning, pasacabenacana recon based on disaster risk-sensitive spatial planning.
		Improve the quality of livelihood of people affected by disasters better.
		Realizing disaster-resilient infrastructure, housing, and settlements.
		Improve the quality of socio-economic recovery, natural resources, and environmental resources.

Source: PP No.87 of 2020 concerning Disaster Management Master Plan

B. Preparation of Questionnaire Preparation with Pairwise Comparison Method

In AHP research where the questionnaire is a comparison between pairs with each other or called (variable). Then the variables are arranged into a matrix to know the level of importance and weight it has (Saaty TL & Vargas LG 2012). This pairwise comparison method is used to derive related tendencies from each variable compared (Osvaldo & Pangemanan, 2016). The pentahelix respondents will be asked to fill out a questionnaire, where each alternative will be faced with each other to be assessed for importance by choosing between numbers 1 and 9.

Table 2. AHP Comparison Scale

Importance	Definition	Information
1	Equally important	Both elements have the same influence.

3	A little more important	Experience and judgment favor one element compared to one's partner.
5	More importantly	One element is favored and practically its dominance is very real, compared to its counterpart element.
7	Very important	One element proved to be highly favored and practically dominated by sanagat, compared to its counterpart element.
9	Absolutely more important	One element is absolutely preferable to its counterpart, at the highest level of confidence.
2,4,6,8	Middle values between two adjoining opinions	Values required a compromise.
Opposite	If *alternative i has one of the numbers above* when compared to alternative j, *then* alternative j *has the opposite when compared to alternative* i.	

Source: Saaty TL and Vargas LG (2012)

C. Data Analysis Using AHP Method

This study uses the AHP method where data analysis is carried out quantitatively and the decision-making process is carried out using the basic principles of decomposition, comparative judgment, synthesis of priority and logic consistency of the pentahelix disaster, so that the weight of each alternative studied can be generated (Saaty, 2008 in Hidayah 2017). In general, the decision making of the AHP method is based on the following steps: (Saaty, 1990 in Arif, 2015) :

1. Define the problem and determine the desired solution, then arrange a hierarchy of the problem at hand. In this study, the problem is that floods occur, solutions are needed in the form of disaster mitigation.
2. Determine the priority of elements.
   a) The first step in determining element priority is to make pairwise comparisons, i.e. compare elements in pairs according to given criteria. In this study, the comparison criteria is to compare between existing strategic policies in RIPB as in Table 1.
   b) The pairwise comparison matrix is filled using the numbers in Table 2. to present the relative importance of one element against another.
3. Perform synthesis. Considerations of pairwise comparison are synthesized to obtain overall priority. The things done in this step are:
   a) Sums the values of each column on the matrix. The value here is a calculation of the benchmarking that has been done.
   b) Divide each value from a column by the total of the corresponding column to normalize the matrix.
   c) Sums the values of each row and divides by the number of elements to get the average value.

4. Measure consistency. In decision making, it is important to know how well consistency exists. Because we don't want decisions based on considerations with low consistency. Things are done in this step as follows:
   a) Multiplies each value in the first column by the relative priority of the first element, the value in the second column by the relative priority of the second element and so on.
   b) Sums each row.
   c) The result and sum of rows are divided by the corresponding relative priority element.
   d) Summing the above quotient by the number of elements present, the result is called λ max.
5. Calculate the Consistency Index with the formula:

$$CI = \frac{(\lambda \max - n)}{n} \quad (1)$$

Where : n = The multiplicity of elements

6. Calculate the *Consistency Ratio with* the formula:

$$CR = \frac{CI}{IR} \quad (2)$$

Where the value of CR depends on the order of the matrix *n*. The condition that if the CR < 0.1 for the AHP model can be determined that the CR ≤ 0.1 then the judgment that has been given is considered fairly consistent. If the data is declared consistent, then the data can be used and analyzed to make a decision. While the IR value can be seen from the following table.

Table 3. Random Consistency, the IR value at the order level

Orde	**1**	**2**	**3**	**4**	**5**	**6**	**7**
IR	0.00	0.00	0.58	0.90	1.12	1.24	1.32
Orde	8	9	10	11	12	13	14
IR	1.41	1.45	1.49	1.51	1.54	1.56	1.57

Source: Saaty TL and Vargas LG (2012)

3. Results and Discussion

A. Result

Based on the results of the study, mitigation strategy is an effort to maximize disaster mitigation to be effective so that disaster mitigation can be coordinated optimally and well. Mitigation efforts carried out must be in accor&ce with problems that occur in the field. In this study there are eight policies used, of the eight policies will be produced 46 alternative policies that exist according to Table 1.

Table 4. Weighting Results with AHP Method

POLICY STRATEGY	WEIGHT					
	PEMDA	BPBD	MDMC	PERP EFFORT (EIGER)	MEDIUM MASS (HARAPAN RAKYAT)	AFFECTED COMMUNITIES
Regional Regulations and Their Implementation in Disaster Management	0,233	0,221	0,245	0,152	0,193	0,182
Coordination among Disaster Management stakeholders	0,129	0,281	0,141	0,179	0,112	0,182
Disaster Risk Assessment	0,262	0,058	0,189	0,130	0,058	0,166
Funding in Disaster Management	0,171	0,165	0,237	0,210	0,200	0,189
Capacity Building of Disaster Management stakeholders	0,112	0,082	0,056	0,066	0,223	0,086
Disaster resilient communities and facilities and infrastructure in Disaster Management	0,061	0,117	0,073	0,060	0,140	0,075
Improving the quality and quantity of human resources in disaster management	0,072	0,043	0,105	0,225	0,045	0,064
Post-Disaster Recovery	0,061	0,034	0,048	0,078	0,091	0,056
Lamda (λ)	8,91	8,13	8,93	8,95	8,58	8,11
Consistency Index (CI)	0,129	0,017	0,132	0,135	0,083	0,015
Random Consistency (IR)	1,410	1,410	1,410	1,410	1,410	1,410
Consistency Ratio (CR)	0,092	0,012	0,093	0,096	0,058	0,010

Source: Research Data (2023)

Based on the results of research obtained from respondents in Table 4, for inconsistency results below 10% or 0.1 which states that the data is consistent. Based on the results obtained that from various existing policy strategies, according to the Banjar City Regional Government, the policy strategy that must be prioritized is related to the disaster risk assessment strategy with a weight of 0.262. According to BPBD Banjar City, the most important policy strategy is related to coordination between stakeholders in disaster management with a weight of 0.281. However, according to MDMC and affected communities, the policy strategy that must be prioritized is funding policy in disaster management with a weight of 0.237 for MDMC and 0.189 for affected communities. According to Eiger, the policy strategy that must be prioritized is a policy related to increasing human resources in disaster management with a boul of 0.225. According to the mass media Harapan Rakyat in disaster management, what must come first is to increase the capacity of disaster management stakeholders with a weight of 0.223.

Once the results are analyzed, the next step is to combine the data to categorize and sort the priority scale based on the weights obtained in Table 5. The weighting results show that the policy with the highest weighting is 0.195. While the policy with the lowest weight is 0.059. Based on the highest and lowest weights, categories are then determined using interval values. The interval value 0.045 is obtained using the Strurgess formula which produces sufficient importance, importance, and very important values respectively with a range of values of 0.059-0.104 (moderately important), 0.104-0.150 (moderately important), and 0.150-0.195 (moderately important).

Table 5. Policy Strategy Priority Scale

Policy Strategy Priority Scale	Weight	Priority Scale	Category
Regional Regulations and Their Implementation in Disaster Management	0,195	1	Very important
Coordination among Disaster Management stakeholders	0,185	2	Very important
Disaster Risk Assessment	0,129	4	Important
Funding in Disaster Management	0,170	3	Very important
Capacity Building of Disaster Management stakeholders	0,089	5	Quite important
Disaster resilient communities and facilities and infrastructure in Disaster Management	0,089	6	Quite important
Improving the quality and quantity of human resources in disaster management	0,085	7	Quite important
Post-Disaster Recovery	0,059	8	Quite important
Lamda (λ)	8,140		
Consistency Index (CI)	0,020		
Random Consistency (IR)	1,410		
Consistency Ratio (CR)	0,014		

Source: Research Data (2023)

Based on the results above, if sorted and sorted into 46 alternative existing policy strategies, several important priorities will be generated in alternative policy strategies. Here are the alternative results of priority strategy policies in Table 6:

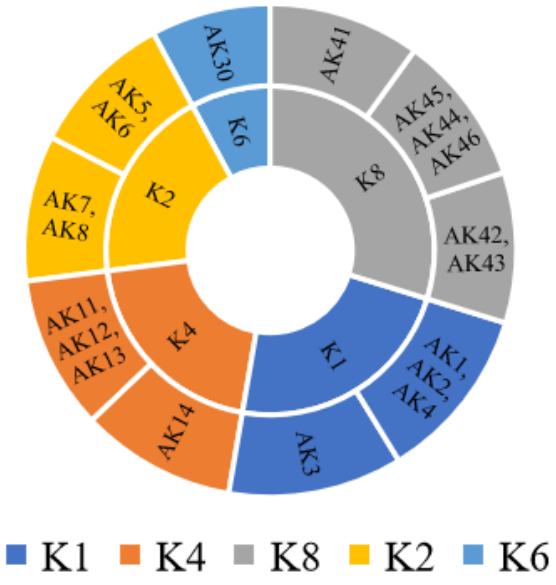

Figure 1. Alternative Priority Policy Strategies

Table 6. Description of Policy Alternative Priority Strategy

K	AK	Alternative Strategies	Weight
K1	AK1	Conducting regulatory reviews	0,0292

	AK2	Monitoring of regulatory implementation	0,0292
	AK3	Evaluate existing norms, standards, procedures, and criteria	0,0291
	AK4	Involving stakeholders	0,0292
K2	AK5	Forming a coordination team	0,0243
	AK6	Increase community participation	0,0243
	AK7	Strengthening early warning systems	0,0243
	AK8	Improve disaster data accessibility and openness	0,0243
K	AK11	Established PB special financial institution	0,0257
	AK12	Developing Corporate Social Responsibility programs	0,0257
	AK13	Prioritizing the use of existing budgets	0,0257
	AK14	Encourage community participation	0,0259
K6	AK30	Improve Skills and Insights in the field of Disaster Management	0,0200
K8	AK41	Provide education and training to affected communities	0,0253
	AK42	Improve access and quality of education services, including providing safe and disaster-resistant educational facilities and infrastructure.	0,0252
	AK43	Conduct socialization to the community and stakeholders about the benefits and importance of disaster-resistant buildings and settlements.	0,0252
	AK44	Increase community capacity and skills in the construction of disaster-resistant buildings through training and skills development.	0,0243
	AK45	Provide training and gui&ce to communities affected by disasters to develop new skills or improve existing skills so that they can earn a decent and independent income.	0,0243
	AK46	Carry out the design and construction of disaster-resistant buildings and building infrastructure in accor&ce with regional characteristics and potential disaster risks.	0,0243

The Policy Strategy above is an alternative result based on respondents using AHP. The results of these alternatives will then be prioritized from other policy alternatives. Based on the results of the policy alternatives above, regulatory studies, regulatory monitoring, and involvement of important stakeholders are prioritized among other policies. So it can be concluded that the priority scale that must be carried out in Banjar City is to make an appropriate disaster regulation study by involving other stakeholders, as well as monitoring to implement the regulation policy.

B. Mitigation Strategies

The flood disaster that occurred in Banjar City is a complex problem. The flood that occurred in Banjar City was caused by the overflow of the Citanduy River and the intensity of high rainfall that lasted a long time. In addition, floods that occur are also caused by changes in land use change and irrigation overflows. There are other factors such as flat topography, causing areas in Banjar City to be prone to flooding. Especially in the northern area of Banjar City which is in a low topography surrounded by highlands in the south and east so that many river channels lead to the area and cause flooding.

Floods that occur in the northern area of Banjar City, are usually caused by overflowing river water and high rainfall. The flood that occurred in the northern region was in the high category, so the impact it caused was the submergence of people's homes, roads, and agricultural land. Meanwhile, for the eastern area of Banjar City, the flood that occurred was in the high category. This is because it is located close to the river where

the flood location is near the flow of watersheds and sub-watersheds. The floods that occurred affected residents' residences and farmland.

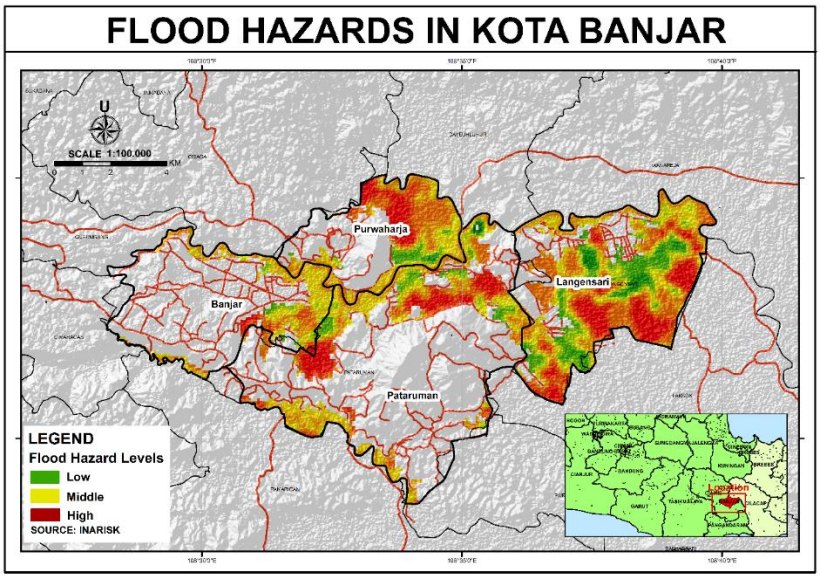

Figure 2. Flood Hazard Map
Source: Data Processing based on Inarisk Data (2022)

Based on the level of &ger above, it will have an impact on the level of flood risk. The level of flood risk in Banjar City is based on the results of the level of &ger, vulnerability, and high category flood capacity (BPBD Kota Banjar, 2023). Almost all areas of Banjar City have a high level of risk. Floods that occur in Banjar City are disasters that occur almost every year and cover almost all districts with high risk. Based on BNPB data for the area of flood risk that occurs in Banjar City is around 5,928 ha, with the affected community around 123,996 people and total physical losses of around 523,323 billion.

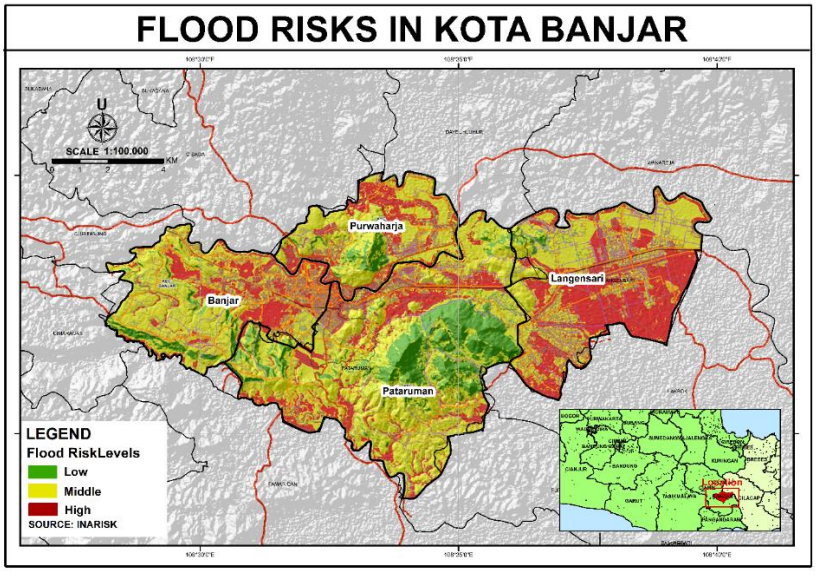

Figure 3. Flood Risk Map
Source: Data Processing based on Inarisk Data (2022)

Based on the results of the study that there are several problems that can cause flooding in Banjar City, such as the lack of communication between the Citanduy River floodgatekeepers and communities along the river flow. This lack of communication results in a lack of preparedness from the community to anticipate the consequences of flood disasters. In addition, this is exacerbated by the absence of an early warning system tool. Early warning system tools are used to determine the condition of the Citanduy River. The information is conveyed to the community to find out the development of the Citanduy River. With this information, the community will be better prepared when a flood occurs.

Poor drainage systems and changes in land use change are also the causes of flooding problems in Banjar City. Poor drainage management can cause flooding in every rainy season. In addition, the amount of garbage dumped into drainage channels causes flooding to be unavoidable every rainy season. This is due to the lack of facilities provided by the government in building temporary landfills (TPS) in the region. In addition, the lack of public concern to preserve the environment by disposing of garbage in its place. Changes in land use change are also a cause in floods. This is due to changes in the function of land that should be able to absorb water but turn into residential buildings. This change can cause flooding in the region.

With so many problems that can cause floods, a form of mitigation strategy is needed to reduce these impacts. Of course, in this case, the government needs to assess the risk of flood disasters and make regulations in accor&ce with the disaster risk conditions. Regulations so far have not been effectively used because they have not adjusted to the flood risk assessment. Therefore, risk assessment is important in designing flood disaster mitigation strategies in Banjar City. Based on the results of the research that has been obtained, here are disaster mitigation strategies in Banjar City that can be done:

1) Local Regulations and Their Implementation

Based on the results of the study, the Banjar City Government has not carried out and implemented regulations related to disaster management in accor&ce with the Disaster Risk Assessment in Banjar City. Government policy in making regional regulations and their implementation is needed as a mitigation strategy in disaster management. Regional regulations or regulatory policies are the basic beginning in making all decisions or direct actions when a disaster occurs. Regulatory regulations play a role in carrying out disaster risk reduction efforts. According to (Coppola, 2006) that regulatory regulations serve to limit the risk of harm through existing legal regulations. Where this regulation is made with the aim of providing guidelines for safe activities and practices that must be applied.

Therefore, based on the results of the study using AHP analysis which is a basic step in designing a flood mitigation strategy, namely by improving regulatory regulations that can be used as guidelines for activities and practices that can be applied in Banjar City. With the gui&ce in the form of regulations, regulations can make it easier to move to the next step. Good regulations can be applied so that they will link one policy to another.

"Regulatory regulations are the basis for making all existing decisions. Regulatory regulations are guidelines for all policies. In addition, regulatory regulations can link one policy to another". (Interview, June 16, 2023, at 9:00 AM, BPBD Kota Banjar).

Of course, in the implementation of this regulatory policy, monitoring steps are needed to supervise or evaluate the policies that have been made. Monitoring is needed to find out the initial error, so that corrective action can be taken to reduce greater risk (Polhukam, 2017). With the monitoring of this regulation, previous policies can be improved such as norms, standards, and procedures that are not good will be evaluated to be improved for the better. In carrying out this policy, of course, it requires many parties, so that existing regulatory policies can be implemented in accor&ce with the needs in reducing the impact of flood disasters.

2) Coordination among Disaster Management Stakeholders

Based on the research results, coordination among stakeholders in Banjar City has not been maximized. Therefore, a policy strategy of coordination among stakeholders in disaster management needs to be implemented to reduce the impact of floods. Coordination among stakeholders in disaster management is needed to reduce the impact of flooding. According to (Ahdi, 2015) The key to success in disaster management is coordination. However, coordination sometimes has complex problems and is not easily solved by one sector alone, so partnerships and collaboration (interoperability) are absolutely necessary to ensure proper handling or response in disaster management. (Anam, K et al. 2018)

An alternative strategy to improve coordination is to increase community participation. Involving the community in the decision-making process and mitigation implementation will help achieve a more comprehensive solution that is acceptable to all parties involved. However, it is not only the community that must contribute to overcoming flood disasters that occur, other stakeholders are needed to assist in dealing with flood disasters that occur. Stakeholders need to cooperate between government institutions or agencies, academics and the community according to their respective roles and duties. (Faturahman, 2018).

“The government needs to coordinate between every line that exists. To reduce the impact that occurs, coordination is needed between the government, the Citanduy River sluice gate, the community, and the housing developer. This coordination is needed to reduce the impact caused by flooding. In addition, the government also needs to assess the impact caused by the housing development in the future". (Interview, June 17, 2023, 12:15 p.m., Sinartanjung Village, Pataruman Sub-district, Kota Banjar).

In addition to coordination, an alternative strategy that the government needs is to build an effective early warning system to reduce the impact caused. An effective early warning system is useful as a sign or a form of anticipation for people who are on the Citanduy river embankment. According to (Bastian, A,. Mardiana, A,. Riyanto, R, 2019) Early warning systems are needed to provide information and early warnings to the community, so as to reduce the impact caused by the unpreparedness of the community in dealing with flood disasters. An early warning system is needed to detect changes in river water levels, namely by using sensors. This sensor will detect changes in river water levels, if the river water exceeds the existing regulatory limits, it will automatically provide flood warnings via SMS gateway and web browser connected point to point to the river monitoring officer and will continue the information to the community. (Usman, Ridwan, & Nasibu, 2019).

The information conveyed must be understood by the community. In addition, disaster-related information must be easily obtained or accessed by the community. This is useful for knowing the conditions that occur in their area. One of them is Satu Data

Bencana Indonesia (SDBI) which must be developed by the government to convey disaster-related information.. (Nopriandi et al. 2020) analyzed the potential of One Disaster Data Indonesia can be used to improve the availability and accessibility of disaster-related data, promote evidence-based decisions, and support coordinated and integrated disaster risk reduction efforts. In addition, according to War&i et al (2021) explained that the impact of One Disaster Data Indonesia can reduce disaster risk and national development in Indonesia. This requires stronger coordination and collaboration among stakeholders in disaster risk reduction efforts.

3) Funding in Disaster Management

Disasters always cause losses to the affected communities. The losses incurred can be in the form of property and lives. Therefore, the government needs to play a role in funding to reduce the impact of disasters. The Banjar City Government should prioritize the use of the existing budget for Disaster Management programs, especially for preventive programs such as disaster mitigation and preparedness improvement. The available budget must be allocated properly and effectively in order to provide maximum benefits. One alternative strategy is to create a Disaster Pooling Fund.

Disaster Pooling Fund (PFB) is a scheme created by the government to collect, accumulate, and distribute special disaster funds by a fund management institution. (Kementerian Keuangan Republik Indonesia, 2023). PFB is established to protect the state budget against disaster-induced pressures through proactive efforts in the non-disaster period, by investing in fund accumulation and risk transfer through insurance. PFB also increases the government's capacity for funding mitigation and preparedness activities in the context of investment to reduce the risk of disaster losses. PFB serves to be able to provide funds towards pre-disaster, emergency response, and post-disaster financing in a sustainable manner.

In addition, based on the results of the research, alternative strategies that need to be carried out by the Banjar City Government are by developing Corporate Social Responsibility (CSR) and encouraging community participation is needed to maximize funding efficiency. The government needs to involve CSR companies to support disaster management programs. According to (Wibisono, 2007 dalam Tulus Irpan, 2020) CSR is a sustainable commitment in the business world to act ethically and contribute to developing the economy of the local community, along with improving the lives of its workers. Therefore, CSR is expected to work with MSMEs as fostered partners in increasing economic resilience with the concept of economic development as reducing disaster risk. One of the priorities in reducing disaster impacts is to invest in disaster risk management for resilience. Therefore, business institutions engaged in the MSME sector must dominate the economic system in Indonesia to increase awareness or pay attention to disaster threats that are in the vicinity so that when the disaster occurs the community becomes resilient in dealing with it. (BNPB, 2021).

4) Disaster Risk Assessment

Based on the results of the study, the Disaster Risk Assessment (KRB) that has been made by BPBD Kota Banjar It is good, but the disaster risk assessment has not been implemented optimally by the people of Banjar City. Disaster risk assessment is the most important policy strategy undertaken to reduce and prevent losses obtained due to floods. According to (Ujung, Nugraha, & Firdaus 2019) Disaster risk assessment is a tool that serves to assess the possibility and magnitude of losses caused by a disaster in an area.

Disaster risk assessment serves to determine disaster zones and determine spatial planning based on regional characteristics and disaster potential. Disaster risk assessment is the basis for preparing a Disaster Management Plan. In addition, disaster risk assessment is also information provided to regions to take appropriate policy steps so that they can improve their regions to reduce the impact of damage caused by disasters.

According to (Idran, 2023) Disaster risk assessment is an approach to show the potential negative impacts that arise calculated based on the level of vulnerability and capacity of the area. The potential negative impact is the potential loss of the affected community or environmental damage. In addition, disaster risk assessment is one of the steps to achieve directed, planned and structured disaster management.

5) Capacity Building of Disaster Management Stakeholders

Increasing the capacity of stakeholders in Disaster Management is a mitigation strategy that serves to reduce the impact of flood disasters. Kota Banjar Government and Kota Banjar BPBD are part of the stakeholders in Disaster Management. Therefore, increasing the capacity of the Kota Banjar Government and Kota Banjar BPBD is needed to reduce the impact of flood disasters. There are several ways that need to be improved by the Kota Banjar Government or Kota Banjar BPBD to improve services or human resources as stakeholders in disaster management:

a) Training and Education. Providing training and education regularly aims to improve knowledge, skills, and competencies.
b) Inter-agency collaboration. Collaboration between institutions in policy making and implementation of PB programs can help increase the capacity and professionalism of PB organizers and actors.
c) Establish Minimum Service Standards (SPM). The government can establish a clear and measurable PB SPM. This SPM should cover important aspects of the NT such as prevention, preparedness, emergency management, and post-disaster rehabilitation.
d) Improvement of Facilities and Infrastructure. BPBD must ensure that the facilities and infrastructure required for PB are available and functioning properly. This will help ensure that PB minimum service standards can be implemented effectively.
e) Strengthening Communication and Information Systems. The government should strengthen communication and information systems to ensure that disaster information can be disseminated quickly and accurately to the public and other stakeholders.
f) Improve the quality of the planning system. The government should improve the quality of the PB planning system to make it more adaptive and sustainable, by involving all stakeholders in the planning process and paying attention to disaster risk factors in every stage of planning.
g) Involve stakeholders in the decision-making process. The government should involve stakeholders in the decision-making process related to PB, including in the planning, implementation, and evaluation of PB programs.

6) Disaster Resilient Communities and Facilities anda Infrastructure in Disaster Management

Based on the results of the study, only a few villages in Banjar City have been affected by disasters. A disaster-resilient community is a community that is expected to be able to civilize and face the threat of disasters that occur in its area (Wahyuni et al. 2022). Communities must be able to respond when a disaster occurs or during disaster recovery. Disaster resilient communities must be equipped with the ability to make

disaster risk reduction efforts, which in this case are realized in development plans that contain prevention and mitigation efforts before a disaster occurs, emergency response during a disaster, and post-disaster recovery. (Prmono, S & Yusuf, 2015)

Creating a disaster resilient community must have several programs such as socialization and making disaster mitigation maps (Oktaviani et al. 2020). Socialization is needed to campaign for public understanding of flood prevention, as well as to educate the community on disaster resilience. In addition, disaster mitigation maps are needed so that people can find out the characteristics and mitigation measures that are suitable for their area. These programs must be carried out properly, in order to create a disaster resilient community.

Facilities and Infrastructure support the creation of disaster resilient communities. Good facilities and infrastructure will certainly make it easier to realize a disaster resilient community. To realize the community around the watershed flow certainly requires a self-warning system tool. The tool in this self-warning system functions as a sensor. This sensor is used as a standard limit to observe and analyze the symptoms of flooding. Procurement of self-warning system equipment is needed to increase community capacity in reducing disaster risk. The provision of self-warning system equipment is one of the efforts made in realizing a disaster resilient community.

There are several reasons why communities in Kota Banjar have not been categorized as disaster resilient communities. This is due to the lack of facilities provided by the Government to create disaster resilient communities. Therefore, the alternative strategies above can be used to improve quality and provide good services so as to create a disaster resilient community.

7) Improving the Quality and Quantity of Human Resources in Disaster Management

Improving the quality and quantity of human resources will certainly have an impact on reducing disaster risk. Public awareness through education and education in mitigation is one form of effort to reduce disaster risk. Efforts to increase public awareness must be in a form that is easily accepted by the public, one of which is through social media education and other media that are easily accessible to the public (Miftakhudin,2021). According to (Namirah, 2015) explained that public education is something that must be considered in mitigation and preparedness, this is because informing the community is the right action in reducing disaster risk. Education to the community aims to train people when disasters occur.

Training in disaster is also needed to improve the quality and quantity of human resources. This training is intended to prepare individuals who are ready to face disasters. The training focused on improving individual and team preparedness in facing disasters. These trainees will be trained in emergency response planning, evacuation, rescue and first aid procedures, use of safety equipment and coordination in emergency situations. In addition, this training also involves simulating exercises and disaster scenarios that occur.

In addition, involving the community to maintain built facilities and infrastructure and care more about environmental issues is an effort to improve the quality and quantity of existing human resources. After the construction of facilities and infrastructure for flood management, good operations and maintenance are needed. Therefore, actively involving the community will be very helpful in maintaining the sustainability of these facilities and infrastructure.

8) Post-Disaster Recovery

The priority scale among other policies is related to post-disaster recovery. Although post-disaster recovery is the last priority scale, this policy still has to be carried out. Post-disaster recovery refers to a series of efforts made after a disaster to restore conditions and restore the lives of affected communities (BNPB, 2012). The main objective of post-disaster recovery is to restore and build physical infrastructure, economic, social, and psychological recovery, as well as increase community capacity and resilience in facing disasters.

To recover after a disaster related to physical infrastructure or increase community resilience in facing disasters, namely by conducting disaster resilient construction training. Providing training to the community in disaster-resilient construction techniques and practices is very useful to improve building structures so as to reduce damage due to disasters that occur. In this training, the community is trained to design disaster-friendly buildings, by paying attention to building layout, use of building materials, and selection of locations that are not vulnerable to disasters. In addition, the community is also taught to monitor the condition of the building, carry out routine repairs, and maintain the cleanliness and safety of the building so that it continues to function properly when facing disasters.

In addition to restoring infrastructure, economic recovery is also needed after the disaster. The government needs to make an economic recovery so that affected communities can recover their lives and build economic independence after the disaster. One of them is by providing job skills training that is in accor&ce with the local community. By equipping disaster-affected communities with entrepreneurial skills, they can start micro or small businesses that can provide a decent and independent income.

4. Conclusion

Flooding that occurs in Banjar City is a complex problem. Flooding that occurs in Banjar City is caused by the overflow of the Citanduy River and high rainfall intensity that lasts for a long time. In addition, flooding is also caused by land use change and irrigation overflow. There are other factors such as the flat topography that makes areas in Kota Banjar prone to flooding. Especially in the northern area of Kota Banjar, which is in a low topography surrounded by highlands to the south and east, many river channels lead to the area and cause flooding. Therefore, there is a need for mitigation strategies that can be implemented in Kota Banjar to reduce the impact caused by flooding.

Based on the results of the analysis of respondents with the concept of Pentahelix Disaster using AHP, the inconsistency ratio value is 0.014 <0.1, which means that the results of the data analysis are acceptable. Based on the results of AHP analysis in making mitigation strategies, it shows that the policy strategy of local regulations and their implementation (weight 0.195), policy strategies related to coordination between stakeholders (weight 0.185), policy strategies related to disaster risk assessment (weight 0.129), policy strategies related to disaster management funding (weight 0, 170), policy strategies related to increasing stakeholder capacity (weight 0.089), strategies in making disaster resilient communities and facilities and infrastructure (weight 0.089), strategies for improving the quality and quantity of human resources (weight 0.085), and strategies for post-disaster recovery (weight 0.059). Based on the AHP results, the highest priority scale based on the weight value is related to local regulation policy strategies and their implementation, stakeholder coordination, and funding in disaster management.

Based on the results of the policy strategy, there are various alternative strategies

that can be used in accor&ce with the existing conditions in Banjar City. Alternative strategies are a form of mitigation that can be carried out by the Banjar City Government to reduce the impact of flood disasters. Based on the results of alternative strategies that need to be prioritized in overcoming flood disasters in Banjar City, namely by making disaster-related regulations in accor&ce with existing disaster risk assessments, and monitoring each regulation. Disaster-related regulations are the basic step in creating a mitigation strategy for flood disasters. The regulations are made to provide guidelines for safe activities and practices that must be implemented. Therefore, in creating a flood disaster mitigation strategy in Banjar City, the first thing to do is to create disaster-related regulations that are in accor&ce with the disaster risk assessment.

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