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Analysis of Flood Vulnerability Level Using Geographic Information Systems in the Pangkep Urban Area

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***Abstract*:-** The Pangkep Urban Area in Pangkajene and Islands Regency is one of the districts in South Sulawesi Province which is often hit by floods. The high intensity of rain triggers river overflows which is one of the causes of flooding. The formulation of the problem in this research is: what is the level of flood vulnerability, and what are the efforts to control flood disasters in the Pangkep Urban Area. In this work, flood data overlay is used to answer the first problem, and SWOT analysis is used to answer the second problem. Flood Prone Areas. Based on the results of the analysis, an area of 4464.478 hectares was obtained. The floods include Boriappaka, Tekolabbua, Anrong Appaka, Sibatua, Bonto Perak, Bontokio, Tamampua, Padoang-doangan, Jagong, Mappasaile and Samalewa sub-districts, all of which are designated as having a high level of flood vulnerability. Meanwhile, the level of moderate flood vulnerability reaches an area of 2,445,702 hectares covering the sub-districts of Pabbundukang, Sapanang, Minasatene, Biraeng, Bonto Perak and Jagong sub-districts. Implementation of a turnaround strategy (quadrant III) with adaptation and protection strategies is based on analysis of SWOT findings.

Keywords: *Flood, Hazard Level, Strategy, Pangkep Urban Area*

I. Introduction

Floods are the most predictable natural disasters. Because it is related to the amount of rainfall. Floods generally occur in low-lying areas and in the downstream parts of river basins. Generally in the form of delta or alluvial. Geologically, it is in the form of a valley or other form of earth basin with low porosity. Flooding is land inundated due to river overflows, caused by heavy rain or flooding caused by shipments from other areas at higher altitudes.[1]

Geographically, the urban area of Pangkajene City is located at 119029'50 - 119036'50" East Longitude and 4048'20" - 4053'20" South Latitude. Geographic Information System (GIS) analysis regarding the delineation boundary area of the 2017 Pangkep Urban Area covers the entire Pangkajene District with an area of 4421.21 Ha with a total percentage of 63.98%, Bungoro District which includes the Samalewa Village, Sapanang and Boriappaka with an area of 1199.68 Ha with a total percentage 17.36%, and Minasatene District which includes the Minasatene Village, Bonto Kio, and Biraeng with an area of 1289.29 Ha with a total percentage of 18.66%. One of the disasters that often occurs in Pangkajene Regency, especially the Pangkep Urban Area, is floods. The chronology of floods occurs due to the high intensity of rainfall resulting in drainage, rivers and dams overflowing resulting in floods that inundate roads and residential areas, public facility areas and social facilities.

According to data from the disaster management operations control center (pusdalops-pb) BPBD pangkep regency, high rainfall has an impact on flood points spread across pangkajene district, namely gusunge village, matahari avenue, padoang doangan, musafir park axis road, gazebo and alun-field. Square in padoang-doangan village. Furthermore, Pangakajene 1 junior and senior state high school are located on axis andi mauraga, padadae village, solo Village in Mappasaile Village. Jagong Village, Bantilang Village and Lombok Village in Tekolabbua Village.

The regional scope of this research is focused on the Pangkep Urban Area, including the sub-districts of Paddoang-Doangan, Boriappaka, Minasatene, Anrong Appaka, Bonto Perak, Pabbundukang, Biraeng, Bontokio, Jagong, Mappasaile, Samalewa, Sapanang, Sibatua, Tekolabbua, and Tumampua. These sub-districts are flood-prone locations which are seriously affected, especially in residential areas along rivers, ponds and coastal areas.

Figure 1. Image map of flood conditions in pangkep urban area

From the description above, it increasingly shows that Pangkajene Regency, especially the Pangkep Urban Area, is still vulnerable to flood disasters. Therefore, there is a need for research based on Geographic Information Systems (GIS) to analyze the level of vulnerability to flood disasters in the Pangkep Urban Area and determine the selection of control measures for flood-prone locations so that the vulnerability of the area and the impact of losses caused by flood disasters can be minimized.

II. Material And Method

a. Study Site

The coverage of sub-district areas which are research areas in the Pangkep Urban Area as in the RTRW of Pangkep Regency covers the entire Pangkajene District with an area of (4,421.21 Ha), Bungoro District which covers the Samalewa, Sapanang and Boriappaka Subdistrict areas with an area of (1,199.68 Ha), and Minasa Te'ne District which covers the Minasa Te'ne, Bonto Kio, and Biraeng Village areas with an area of (1,289.29 Ha).

b. Methods

The methodological approach begins by analyzing the characteristics of floods that occur at the research location, such as the area of inundation, the maximum height of inundation that occurs, and the length of time it recedes. Then create a thematic map for each flood vulnerability parameter. Next, give dignity and weight to each flood parameter. Then analyze the overlay of locations that are prone to flooding using the ArcGIS 10.3 application. After the location's level of flood vulnerability has been successfully analyzed, the next step is to carry out a SWOT analysis to produce strategies related to efforts to control flood-prone locations.

Flood disasters have a classification of land characteristics that are crucial in influencing flood-prone areas. There are several factors that influence an area to become a flood-prone area, namely:[2]

a. River flow is considered one of the factors that influences flood vulnerability. The distance factor is based on the assumption that the closer the distance to the river, the greater the potential for the area to be flooded. On the other hand, the farther an area is from a river, the smaller the potential for experiencing flooding.[3]

b. Soil type greatly influences the infiltration process (absorption capacity). Soil that has a fine texture has low absorption capacity, causing surface flow to increase. On the other hand, soil types with a rough texture have a high absorption capacity. So the lower the absorption capacity of a type of soil, the more vulnerable it is to flood disasters.[4]

c. Land use or land use planning is an effort to plan land use in an area which includes dividing areas to specialize certain functions, for example residential, trade, industrial, etc. A land use plan is a framework that determines decisions regarding the location, capacity and schedule for building roads, clean water and waste water channels, school buildings, health centers, parks and service centers and other public facilities.[5]

d. The slope of the slope affects the amount and speed of surface runoff. It is assumed that the gentler the slope, the slower the flow of surface runoff and the greater the possibility of inundation or flooding. Meanwhile, the steeper the slope, the faster the surface runoff will flow so that rainwater that falls is channeled directly and does not inundate the area, so the risk of flooding is small.[6]

e. Rainfall is the amount of rainwater that falls on an area in a certain time (Darmawan et al. 2017). High rainfall is more likely to cause flooding than low intensity rainfall in an area. This is because high-intensity rainfall contributes more to the water discharge into the river and if the river's capacity is exceeded, it results in flooding.[2]

c. Collecting Data

To obtain the necessary data, both primary data and secondary data, the data collection technique is carried out as follows:

a. Data requests, namely collecting secondary data from related agencies as well as theories related to the problem being studied including research journals, statistical data from both BPS and government agencies.

b. Direct observations or interviews regarding existing conditions in the Pangkep Urban Area and then conducting literature studies to determine flood control and mitigation efforts.

c. Documentation, namely recording existing conditions in the field visually in the form of drawings or photographs related to government efforts in flood adaptation and mitigation in the Pangkep Urban Area, Pangkajene Regency and the Islands.

Tabel 1. Data Requirements and Data Sources

No	Data Requirements	Identity	Data Type	Data source
1	Disaster	RTRW Pangkajene and Islands Regency (policies regarding flood-prone areas)	Secondary	BPBD Office, BAPPEDA Office, and PUPR Office

2	Environmental Physical Conditions	Rainfall Slope Type of soil Land use River flow	Primary, Secondary	BAPPEDA Office, PUPR Office, BPBD Office, BMKG Office
3	Population Data	Pangkajene and Islands Regency in numbers	Secondary	Central Statistics Agency (BPS) Office
4	Facilities and infrastructure	Facilities and infrastructure	Primary, Secondary	District Office, BPS Office

d. Data Analysis

D.1. Rating and Weighting Analysis

Determining flood-prone areas uses a scoring and weighting method for each variable where the results of multiplying and adding these variables to determine flood-prone areas by dividing the classification into 5 classes between the highest and lowest values.

The thematic structure of flood-prone areas in this study produces 3 level classes, namely low flood vulnerability, moderate flood vulnerability and high flood vulnerability. Determining flood-prone areas is carried out using the overlay method where each variable is given a score based on vulnerability to flooding.

The weight and score of each variable used to determine the flood vulnerability level class are:

Tabel 2. Annual Rainfall Intensity

No.	Annual Rainfall	Honor	Weight	Score
1.	> 3000 mm	5	3	15
2.	2500 - 3000 mm	4		12
3.	2000 - 2500 mm	3		9
4.	1500 - 2000 mm	2		6
5.	< 1500 mm	1		3

Source: Primayuda. (2006)[7]

Tabel 3. Slope Classification

No.	Slope (%)	Honor	Weight	Score
1.	0-2	5	3	15
2.	2-15	4		12
3.	15-25	3		9
4.	25-40	2		6
5.	> 40	1		3

Source: Van Zuidam, 1985

Tabel 4. Soil Texture Classification

No.	Soil Texture	Honor	Weight	Score
1.	smooth	5	2	10
2.	rather smooth	4		8
3.	medium	3		6
4.	rather rough	2		4
5.	rough	1		2

Source: Primayuda (2006)

Tabel 5. River Flow Buffer Classification

No.	River Buffer	Honor	Weight	Score
1.	0 - 25	5	3	15
2.	25 - 50	4		12
3.	50 -75	3		9
4.	75 - 100	2		6
5.	>100	1		3

Source: Primayuda (2006)

Tabel 6. Land Use Classification

No.	Land Use	Honor	Weight	Score
1.	Open land, rivers/canals, lakes, swamps, puddles, ponds	5	2	10
2.	Settlements, mixed gardens, yard plants, trade and services, fields, cemeteries, education	4		8
3.	Agriculture, rice fields, moors	3		6
4.	Plantation, bush	2		4
5.	forest, mangrove	1		2

Source : Primayuda (2006)

Tabel 7. Flood Prone Level Score

No.	Level of Vulnerability	Score
1.	Low Flood Prone	0 - 22
2.	Medium Flood Prone	22 - 44
3.	High Flood Prone	44 - 65

Source : Primayuda (2006)

D.2. Overlay Analysis

Overlay is the ability to place one map graphic on top of another map graphic and display the results on a computer screen or on a plot. In other words, overlay displays a digital map on another digital map along with its attributes and produces a combined map of the two which has attribute information from both maps.

This overlay analysis is used to determine areas prone to flooding based on several basic physical aspects, namely rainfall, soil type, slope and land use in an area based on grading and weighting.

In analyzing a map overlay of flood-prone areas using ArcGis 10.3, the following steps are used to carry out the overlay: (Wahana Komputer, 2015).

1. Display four maps that will be overlaid on the ArcGis 10.3 application;
2. Select Add Data and select the map storage directory then click Add and the map will automatically appear on the layer;
3. Select Intersect in the Georeferencing tool then select Input Feature in the Intersect process;
4. Enter the four base maps used then select the directory for storing the map overlay results, then click Save and click OK;
5. Automatically the overlay results will appear on the ArcGis 10.3 layer;
6. Add a value attribute to the attribute table then right click the shapefile and select Open Attribute Table then add a table column by clicking Table Options then click Add Field, provide a name for the column and select Short Integral;
7. Next, click Start Editing in the Editor tool then block the value table then right click and click Field Calculator, select the attributes to be added then click OK;
8. Sort the values from smallest to largest by blocking the value table and selecting Sort Ascending then click Stop Editing in the Editor tool then click Save in the Stop Editing Option;
9. Based on the overlay results, you need to combine the same attributes in the table with Dissolve in Geoprocessing then select the Input Feature that will be processed (overlay result data) then select the storage directory then select (√) in the attribute table column that will be used and click OK;
10. After Dissolve, you must add a class table to determine the level of flood danger, for example the level of low flood vulnerability, medium flood vulnerability, and high flood vulnerability. Right click on the Shapefile then Open Attribute Table then add a table column by clicking Add Field then provide a name for the column and select Short Intergral;
11. Next, click Start Editing on the Editor tool, give a class to each digitized polygon then click Stop Editing on the Editor tool, click Save on the Stop Editing Option then close the attributes and return to the Layer Window. So a disaster hazard map is formed along with flood hazard level classes.

Creating interval values for flood vulnerability classes aims to differentiate one class of flood vulnerability from another. The formula used to create interval classes is: (Sturgess, 2013).

$$Ki = \frac{Xt - Xr}{k}$$

Ki = Interval Class
Xt = Highest Data
Xr = Lowest Data
k = Number of Classes

The interval value is determined using a relative approach by looking at the maximum and minimum values for each mapping unit. The interval class is obtained by finding the difference between the highest data and the lowest data and dividing by the number of desired classes.

D.3. Flood Control and Mitigation Efforts

The formulation of the SWOT analysis compares the internal factors categorized in the IFE (Internal Factor Evaluation) matrix, while the external factors are categorized in the EFE (External Factor Evaluation) matrix.

The weight of each parameter is in the range 1-5 (not important-very important). The weight value shows the level of importance of one parameter relative to other parameters. Meanwhile, the rating is determined to determine the level of importance of each factor. A scale value of 5 is given to each parameter based on a literature review where a value of 5 means the influence of the parameter on development is very high while a value of 1 is very low. Meanwhile, the calculation of the score for each factor is by weight multiplied by the rating Determine the diagram coordinates with internal analysis coordinates (x) = (total strength score – total weakness score): 2 and external analysis coordinates (y) = (total opportunity score – total threat score): 2.

Tabel 8. Research Detail Matrix

No	Formulation Of The Problem	Research Purposes	Concepts And Variables	Data And Information	Data And Information Sources	Data And Information Collection	Data Analysis
1	2	3	4	5	6	7	8
1.	What is the level of flood vulnerability in the Pangkep Urban Area, Pangkajene and Islands Regency?	Analyzing the level of flood vulnerability in the Pangkep Urban Area, Pangkajene and Islands Regency.	1. Rainfall 2. Slope 3. Soil type (soil texture) 4. Land use River flow	1. Annual rainfall intensity 2. Classification of slope slope 3. Soil texture classification 4. Classification of land use in the Pangkep Urban Area 5. Distance between Pangkep Urban Area and river flow	1. BPS Office 2. BAPPEDA Office 3. PUPR service office 4. BPBD office 5. BMKG office 6. District Office 7. Satellite Image Data	Data Request, Field Observation	1. Analysis of weighting and awards 2. Overlay Analysis
2.	What are the efforts to control flood-prone locations in the Pangkep Urban Area, Kab. Pangkajene and the Islands?	Determine control efforts for flood-prone locations in the Pangkep Urban Area, District. Pangkajen	1. Choice of flood control measures 2. Structural/non-structural mitigation options	1. Results of Analysis of Flood Vulnerability Levels 2. RTRW of Pangkajene and Islands districts 3. District RPJMD.	1. Bappeda Office 2. BPBD Office 3. PUPR Office 4. District Office	Document Study And Interviews	SWOT analysis

		e and the islands.		Pangkajene and the Islands 4. Disaster Management Plan (RPB) 5. Policies related to research			

III. Result And Discussion

a. Spatial Data Analysis for Classification of Flood Prone Areas

The flood danger level in Tempe District can be classified into three classes: low, medium and high. Based on reference table 1, the flood danger level is calculated from the score of each calculated flood danger level parameter, including the Soil Type map, rainfall map, slope map, river flow buffer map, and land use map.

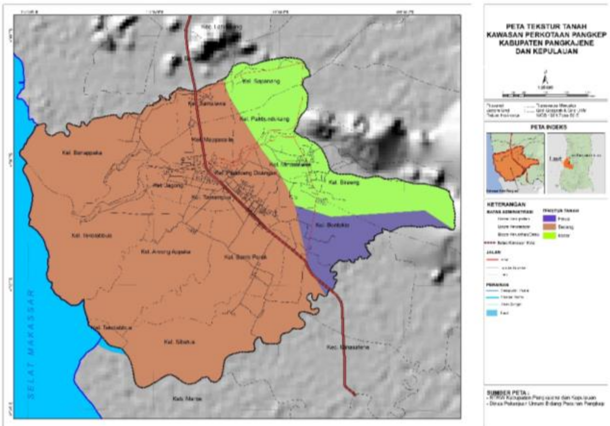

Figure 3. Soil Texture Map of Pangkep Urban Area

Tabel 9. Soil Texture Classification

Data Type	Honor	Weight	Score
Soil Type (Soil Texture)			
Litosol (Coarse)	1	2	2
Podzolic (Medium)	3	2	6
Latosol (Slightly Fine)	4	2	8

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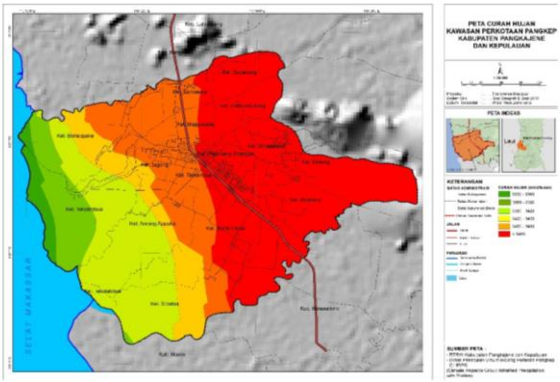

Figure 4. Rainfall Map of Pangkep Urban Area

Tabel 10. Annual Rainfall Intensity

Data Type	Honor	Weight	Score
Rainfall (mm2) / Monthly			
3330 – 3360	5	3	15
3360 – 3390	5	3	15
3390 – 3420	5	3	15
3420 – 3450	5	3	15
3450 – 3480	5	3	15
>3480	5	3	15

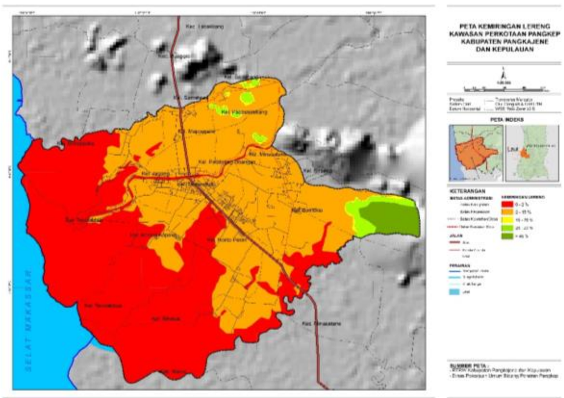

Figure 5. Slope Map of Pangkep Urban Area

Tabel 11. Slope Classification

Data Type	Honor	Weight	Score
Slope			
0 - 2 %	5	3	15
2 - 15 %	4	3	12
15 - 25 %	3	3	9

25 – 40 %	2	3	6
> 40 %	1	3	3

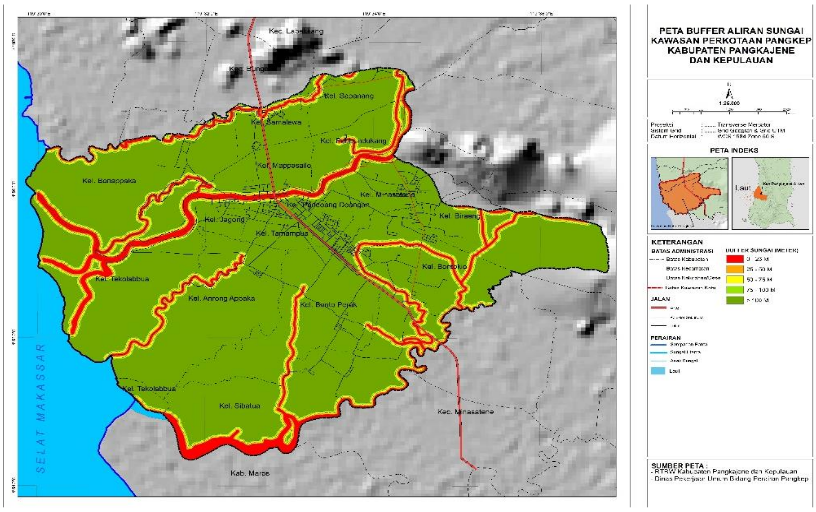

Figure 6. River Flow Map of Pangkep Urban Area

Tabel 12. River Flow Buffer Classification

Data Type	Honor	Weight	Score
River Flow Buffer			
0 - 25	5	3	15
25 - 50	4	3	12
50 -75	3	3	9
75 - 100	2	3	6
>100	1	3	3

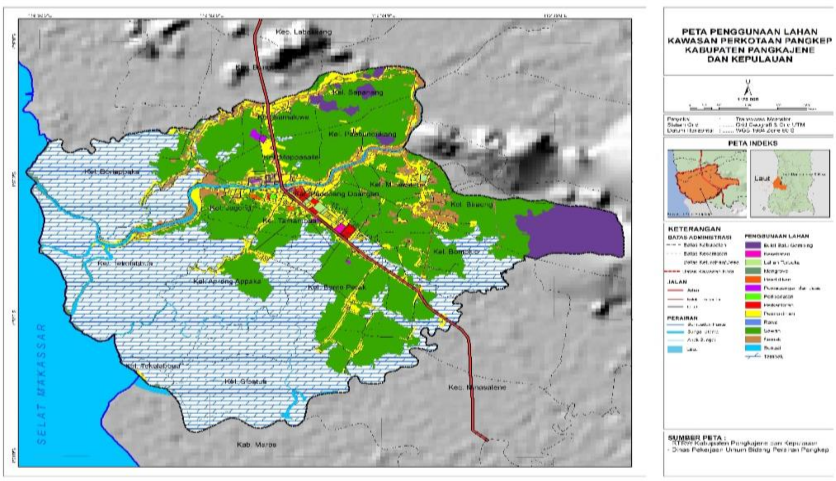

Figure 7. Land Use Map of Pangkep Urban Area

Tabel 13. Land Use Classification

Data Type	Honor	Weight	Score
Land Use			
River	5	2	10
Pond	5	2	10
Swamp	5	2	10
Open field	5	2	10
Trade and Services	4	2	8
Settlement	4	2	8
Education	4	2	8
Health	4	2	8
Worship	4	2	8
Office	4	2	8
Ricefield	3	2	6
Bush	2	2	4
Mangroves	1	2	2
Limestone Hill	1	2	2

Based on the results of the Flood Prone Level Map overlay, in the Pangkep Urban Area that is affected by a high level of vulnerability, these are Boriappaka, Tekolabbua, Anrong Appaka, Sibatua, Bonto Perak, Bontokio, Tamampua, Padoang-doangan, Jagong, Mappasaile and Samalewa sub-districts. Because several areas in this sub-district directly border rivers and coastal areas. Meanwhile, the sub-districts affected by the medium level of vulnerability are Pabbundukang, Sapanang, Minasatene, Biraeng, Bonto Perak and Jagong sub-districts. Because the area in this sub-district has a slope of more than 15% and the type of soil has a soil texture with good water absorption capacity. Please see the map below for more details:

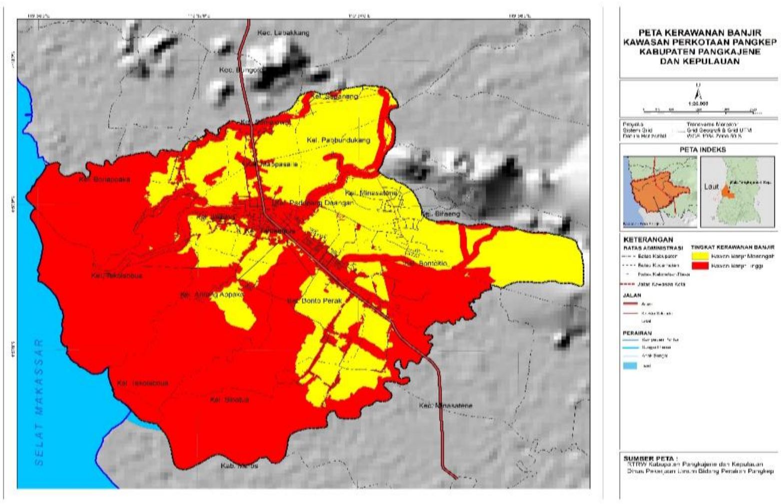

Figure 8. Flood Hazard Level Map

b. Flood Disaster Mitigation Strategy

SWOT analysis is used to analyze flood disaster mitigation strategies in the Pangkep Urban Area by comparing the internal factors included in the IFE (Internal Factor Evaluation) matrix, while the external factors are categorized in the EFE (External Factor Evaluation) matrix. Internal factors are factors related to society and events that occur in flood-prone locations and are determined based on strengths and weaknesses. External factors are external influences that have an impact on flood-prone locations, related to government regulations and other factors, which are then classified as opportunities and threats.

Tabel 14. Internal Factor Analysis

No	Strength	Weight	Rating	Score
1	Several communities have made efforts to control flood disasters independently	0.103	4.00	0.41
2	Several communities carry out mutual cooperation actions to preserve the environment	0.103	4.40	0.45
3	Some communities still maintain the Makassar Bugis tribe building models such as houses on stilts	0.084	3.40	0.28
4	Embankments have been built along river flows around the Pangkep Urban Area settlements	0.108	4.60	0.49
Total Strength		0.398	16.40	1.64
No	Weakness	Weight	Rating	Score
1	Some people do not care about the cleanliness of their environment	0.098	4.00	0.39
2	Some people do not know about disaster warnings and evacuation efforts	0.089	3.80	0.34
3	Most of the densely populated areas are built around rivers and pond areas that border the sea	0.107	4.20	0.45
4	Suboptimal drainage infrastructure	0.103	4.60	0.47
5	There is shallowing of the river flow due to sedimentation from the upstream river	0.107	4.20	0.45
6	There is an economic gap between communities	0.093	3.80	0.35
Total Weakness		0.597	24.60	2.46

Tabel 15. External Factor Analysis

No	Opportunity	Weight	Rating	Score
1	There are regional regulations and implementation policies from regional leaders regarding flood disaster mitigation in the Pangkep Urban Area.	0.114	4.60	0.52
2	The important role of Regional Disaster Management Agency agencies in preventing disasters, taking emergency action during disasters, and post-disaster recovery.	0.119	4.60	0.55

3	The Pangkep Urban Area is a strategic location which makes this location receive important attention from the local government regarding flood disaster management efforts.	0.114	4.60	0.52
4	Availability of early warning devices when a flood disaster occurs.	0.105	4.40	0.46
5	The availability of a tool or technology to convey information about a disaster occurring quickly and practically.	0.100	4.80	0.48
Total Opportunity		0.552	23.00	2.54
No	Threats	Weight	Rating	Score
1	There is shallowing of the river due to sediment erosion from upstream which causes flooding	0.119	5.00	0.60
2	Some people do not know about disaster warnings and evacuation efforts	0.105	4.60	0.48
3	Most of the densely populated areas are built around rivers and pond areas that border the sea	0.110	4.80	0.53
4	Suboptimal drainage infrastructure	0.110	5.00	0.55
Total Threats		0.444	19.40	2.16

Table 15 above shows that the comparison of opportunity and threat scores is 2.54 versus 2.16, which indicates that there is a strong influence on the opportunity factor. So the results of calculating internal and external factor scores produce coordinate points in the SWOT quadrant with the following results:

Internal (x) = Total strength score – total
weakness score
= 1.64 – 2.46
= -0.82
Eksternal (y) = Total opportunity score – total
threat score
= 2.54 – 2.16
= 0.38

Then we get point (x) at -0.82 and point (y) at 0.38 which describes the SWOT quadrant as follows:

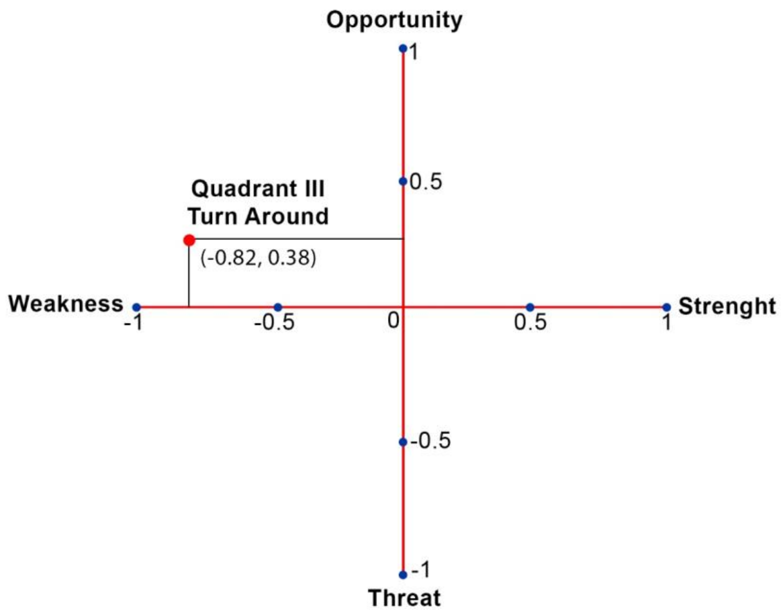

Figure 9. SWOT Quadrant Score Results

From Figure 9, the resulting strategy results are in quadrant III, namely the turn-around strategy, meaning that mitigation management has a dominant opportunity. So the priority strategy of the weakness and opportunity strategy is to create a strategy that minimizes the weaknesses obtained in order to take advantage of existing opportunities.

The choice of flood disaster mitigation strategy in the Pangkep Urban Area is based on various things related to the strategies that have been identified in the SWOT matrix, including:

factor Internal	**Strengths (S)**	**Weakness (W)**
	1. Several communities have made efforts to control flood disasters independently 2. Several communities carry out mutual cooperation actions to maintain the environment 3. Some communities still maintain the Makassar Bugis tribe's building model, such as houses on stilts 4. Embankments have been built along the river flow around the Pangkep Urban Area settlements	1. Some people do not care about the cleanliness of their environment 2. Some people do not know about disaster warnings and evacuation efforts 3. Most of the densely populated areas are built around rivers and pond areas that border the sea 4. Drainage infrastructure is less than optimal 5. There is shallowing of the river flow due to sedimentation from the upstream river 6. There is an economic gap between communities

factor **Eksternal**		
Opportunities/Opportunities (O) 1. The existence of regional regulations and implementation policies from regional leaders regarding flood disaster mitigation in the Pangkep Urban Area 2. The important role of Regional Disaster Management Agency agencies in preventing disasters, taking emergency action during disasters, and post-disaster recovery 3. The Pangkep Urban Area is a strategic location which makes this location receive important attention from the local government regarding flood disaster management efforts 4. Availability of early warning devices when a flood disaster occurs 5. Availability of a tool or technology to convey information about a disaster occurring quickly and practically	**S-O Strategy** 1. Optimize government and community cooperation so that programs can run in a structured manner. (S1,S2-01,02,03)-DINSOS, BPBD 2. Maximizing community empowerment, such as establishing environmental conservation institutions. (S1,S2, -01) – PMD, DLH 3. Plan community empowerment programs through environmental conservation. (S3, -01.02) - PMD, DINSOS	**W-O Strategy** 1. Optimize the operation of outreach programs related to environmental conservation for the community. (W1, W3-01, 02, 03) – BPBD, DLH, DINSOS 2. Maximize the quality capacity of the drainage network and water catchment areas in the Pangkep Urban Area. (W3, W4, W 5, -01.03) – BAPPELITBANGDA, PUPR 3. Operate information technology devices such as socializing early warning systems (EWS), both conventional and modern, for example the information reminder system (SI-REM) in the form of audio visual/alarms. (W2-04, 05) – Diskominfo, BPBD 4. Emphasize the supervisory and control function regarding spatial planning implementation regulations. (W1, W3 -01)-BAPPELITBANGDA, PUPR
Threats/Treaths (T) 1. There is shallowing of the river due to sediment erosion from upstream which causes flooding 2. Some people do not know about disaster warnings and evacuation efforts 3. Most of the densely populated areas are built around rivers and pond areas that border the sea 4. Drainage infrastructure is less than optimal	**S-T Strategy** 1. Conduct outreach to the community to increase awareness of the importance of environmental conservation, especially in river flows and coastal areas and the importance of helping each other as victims of flood disasters. (S1, S2 T1, T3) - BAPPELITBANGDA, DINSOS, DLH, BPBD	**W-T Strategy** 1. Optimize maintenance related to facilities and infrastructure for public facilities and social facilities, especially health facilities and clean water. (W1, W3, W6 T1, T2,T3, T4) - PUPR, PDAM, DINKES 2. Classify and prioritize treatment assistance for underprivileged communities. (W6- 01, 02, 03, -T1) - BPBD, DINSOS

IV. Conclusion

Based on the rectification of the image data and the results of the analysis carried out, conclusions were obtained based on the objectives of the research carried out, namely as follows:

- Based on the results of the overlay analysis used on four parameters, namely land use map, soil type map, rainfall map, and slope slope map which produces a map of the level of flood vulnerability in the Pangkep Urban Area due to high rainfall, making it possible for river overflows to occur and coastal areas which flood pond areas and residential areas, while the classification of high flood vulnerability levels in the Pangkep Urban Area with an area of 4464.478 Ha includes Boriappaka sub-district, Tekolabbua, Anrong Appaka, Sibatua, Bonto Perak, Bontokio, Tamampua, Padoang-doangan, Jagong, Mappasaile and Samalewa sub-district have a high level of flood vulnerability because several areas in these sub-districts directly border rivers and coastal areas. Meanwhile, the classification of medium flood vulnerability level with an area of 2445,702 Ha includes Pabbundukang sub-district, Sapanang, Minasatene, Biraeng, Bonto Perak and Jagong sub-district which are in the medium flood area because they have slopes above 15% and type Soil that has a soil texture with good water absorption capacity.
- Based on the results of the SWOT analysis used to produce flood disaster mitigation strategies, the implementation of a turn-around strategy in (quadrant III) with adaptation and protection is obtained, namely: Optimizing the operation of outreach programs related to environmental conservation to the community, while the relevant stakeholders are the Regional Disaster Management Agency, Environmental Services, and Social Services. Maximizing the quality of drainage network capacity and water catchment areas in the Pangkep Urban Area, the relevant stakeholders are the Regional Development Planning, Research and Development Agency and the Public Works and Spatial Planning Agency. Operate information technology devices such as outreach regarding early warning systems (EWS), both conventional and modern, for example the reminder information system (SI-REM) in the form of audio visual/alarms. Relevant stakeholders are the Information Communication and Statistics Service and the Regional Disaster Management Agency. Emphasize the supervisory and control functions related to the rules for implementing spatial planning, while the relevant stakeholders are the Regional Development Planning, Research and Development Agency and the Public Works and Spatial Planning Service.

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