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# SPATIAL EVALUATION OF AMBON CITY SPATIAL PLAN FROM FLOOD VULNERABILITY ASPECT

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ABSTRACT

Flooding is a common disaster in Indonesia, including Ambon City. This study evaluates the 2011-2031 Ambon City Spatial Plan (RTRW) with a focus on flood vulnerability using the Multi-Criteria Analysis (MCA) method. Six crucial parameters, such as landform, elevation, land use, river buffers, soil type, and rainfall, were analyzed. The results show that Flood Hazard areas are dominated by low (22,461 ha), medium (9,872 ha), and high (1,833 ha) classes. Crucial findings indicate that 50.08% of settlements (2,222 ha) are in the high hazard class and 49.91% (2,214 ha) are in the medium class. The most vulnerable spatial pattern is medium-density settlements. Therefore, strategic recommendations include strengthening drainage infrastructure, implementing strict zoning for new developments, and increasing community participation in spatial planning. These steps are expected to increase the city's resilience to flooding and support environmental sustainability.

## A. INTRODUCTION

Flooding is the event of rising water levels that overflow from rivers, lakes, or seas to lower lands, such as settlements, roads, and agricultural areas (Fadhil et al., 2020). Flooding occurs when the flow of water into an area exceeds the ability of the watercourse to channel it out, or when there is heavy rain that causes water to not be absorbed by the soil quickly, resulting in inundation that disrupts human activities (Allafta & Opp, 2021). Floods can cause damage to property and infrastructure and jeopardize the safety of people and animals. Flooding often occurs naturally, but it can also be caused by human actions, such as development in flood-prone areas and the dumping of garbage that blocks the flow of water (Shreevastav et al., 2022)

Based on historical data, Ambon City is one of the cities in Indonesia that is prone to flooding, especially during the rainy season. Based on data from the National Disaster Management Agency (BNPB), it explains that in the last three years flooding occurred in several areas in Ambon City due to heavy rains, causing damage to several infrastructures and vehicles and causing some residents to be

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forced to flee to higher ground: climate change, high rainfall, illegal logging, geographical conditions, and uncontrolled settlement development (Badan Nasional Penanggulangan Bencana, 2025). Therefore, continuous attention and prevention efforts are needed to reduce the impact of flooding in Ambon City. The local government can make various efforts, such as improving drainage systems and infrastructure, regulating spatial planning, and conducting educational campaigns to the community about the importance of protecting the environment in order to reduce the risk of flooding (Rakuasa et al., 2022). In addition, the community also needs to participate in flood prevention efforts by not littering and paying attention to the surrounding environment (Rakuasa and Budnikov 2024).

Based on previous research conducted by Rakuasa et al. (2022), he explained that there are several factors that can cause flooding in Ambon City, among others: climate change, high rainfall, illegal logging, geographical conditions, and uncontrolled settlement development. Therefore, continuous attention and prevention efforts are needed to reduce the impact of flooding in Ambon City. The local government can make various efforts, such as improving drainage systems and infrastructure, regulating spatial planning, and conducting educational campaigns to the community about the importance of protecting the environment in order to reduce the risk of flooding. In addition, the community also needs to participate in flood prevention efforts by not littering and paying attention to the surrounding environment (Wang et al., 2023).

To reduce the risk of flooding, efforts are needed that involve many parties, including the local government, the community, and the private sector. Efforts that can be made include improving drainage systems, maintaining the existence of forests and open land, and building settlements by paying attention to good spatial planning (Mai Sy et al., 2023). One of the efforts to prevent and alleviate losses and damage due to flood disasters in the future is to conduct flood risk mapping in Ambon City. The first step that needs to be done is to assess Flood Hazardds by considering the influence of factors that cause flooding, which are then spatially modeled to reflect the spatial distribution of Flood Hazardd levels through visualization of Flood Hazardd maps (Tzioutzios & Kastridis, 2020). By using geospatial technology, namely Geographic Information Systems (GIS), we can model and map Flood Hazardds in an area based on factors that cause flooding, such as rainfall, slope, elevation, land cover, and distance from rivers, to produce Flood Hazardd maps and prediction maps of flood-affected settlements (Chen, 2022).

Evaluating the Spatial Plan is an important step to ensure that the development of a region or area is carried out in a planned, coordinated, and sustainable manner. Evaluating the 2011-2031 Ambon City Spatial Plan (RTRW) needs to be revised to prevent overlapping land use, ensure effective and efficient land use, improve environmental quality, ensure community participation, and improve policy effectiveness. Evaluating the 2011-2031 Ambon City Spatial Plan (RTRW) based on flood vulnerability in Ambon City is very important to do because flooding is one of the natural disasters that often occurs in Ambon City and can cause serious damage to the community and the environment.

According to the researchers, there are several reasons why it is necessary to evaluate the RTR based on flood vulnerability in Ambon City, including: (1) Preventing flooding: Evaluating the spatial plan based on flood vulnerability can help the government and community prevent flooding in the area. Evaluating the spatial plan based on flood vulnerability can also help reduce the impact of flooding on communities and the environment. By evaluating the RTR based on flood vulnerability, areas prone to flooding can be identified, and more effective flood prevention and management measures can be taken. (3) Maintaining environmental quality: Evaluating spatial plans based on flood vulnerability can help maintain environmental quality in the area. By evaluating the RTR based on flood vulnerability, environmentally friendly regional development that takes into account sustainability can be carried out. (4) Involve community participation: Evaluating the RTRW based on flood vulnerability needs to involve community participation so that the needs and aspirations of the community can be accommodated in the RTRW.

By involving the community, regional or local development can be carried out more accountably, transparently, and with the support of the community. By evaluating the RTRW based on flood vulnerability in Ambon City, it is hoped that a more planned, coordinated, and sustainable regional development can be created, as well as reducing the impact of flooding on the community and environment. This research aims to analyze the distribution of land flood vulnerability areas and evaluate the 2011-2031 Ambon City Spatial Plan (RTRW) against flood vulnerability.

## B. METHOD

This research was conducted in Ambon City, Maluku Province, which consists of Sirimau, Nusaniwe, Teluk Ambon, Teluk Baguala, and South Leitimur Districts. The data used in this study consisted of vector Rupa Bumi Indonesia (RBI) data of Ambon City, the

National DEM Digital Elevation Model obtained from the Geospatial Information Agency (BIG), Landsat 8 images obtained from the official website of the United States Geological Survey (USGS), rainfall data obtained from the website of the Ambon City Meteorology Climatology and Geophysics Agency and the soil type map also the Regional Spatial Plan (RTRW) of Ambon City in 2011-2031 were obtained from the Ambon City Planning and Development Agency.

Based on previous studies and general conditions in the field. So, this study uses six parameters that cause flooding, like; landform, elevation, land use, river buffer, soil type, and rainfall. The six parameters were analyzed using the Multi-Criteria Analysis (MCA) method. MCA is an effective method for analyzing Flood Hazardds in an area based on parameters that cause flooding (Oyedepo et al., 2021: Chen, 2022). The six parameters used are given weights and scores based on their level of influence in causing flooding in Ambon City.

The complete scores and weights of the flood-causing parameters can be seen in Table 1. Flood Hazardd analysis in Ambon City was carried out by overlaying and then summing up the scores and weights of the six parameters that cause flooding using the field calculator tool in ArcGIS software. The formula used in this study was modified from research (Aziza et al., 2021: Rakuasa et al., 2022), namely:

FH = (LE Score×20) + (L Score ×10) + (ST Score ) + (RB Score×20) + (LU Score×25) +(R Score×15)……...(1)

Information:
FH: Flood Hazard
LE: Land Elevation
L: Landform
ST: Soil Type
RB: River Buffer
LU: Land Use
R: Rainfall

(Source: Aziza et al., 2021: Rakuasa et al., 2022)

The sum of the scores and weights of the six parameters is then divided into three Flood Hazardd classes. Flood maps were then overlaid with settlement data to predict residential areas affected by flooding. The method used to evaluate the Regional Spatial Plan (RTRW) based on Flood Hazardd vulnerability in Ambon City is Multi-Criteria Analysis (MCA), by overlaying the Flood Hazardd map with the Ambon City Regional Spatial Plan (RTRW) Map 2011-2031, namely the spatial pattern map, to determine the type of spatial pattern affected by flooding in Ambon City.

The results of this analysis provide useful information to formulate recommendations for more effective spatial planning, including the

development of drainage infrastructure and land use management, to improve the resilience of the area to flood disasters in Ambon City.

**Table 1. Flood Causation Variables**

| No | Variables | Classification | Score | Weight |
|---|---|---|---|---|
| 1 | Land Elevation | <10 msl | 5 | 20 |
| | | 10-50 msl | 4 | |
| | | 50-100 msl | 3 | |
| | | 100-200 msl | 2 | |
| | | > 200 msl | 1 | |
| 2 | Landforms | Flat 0 - 4% | 5 | 10 |
| | | Flat - Sloping 4 - 8% | 4 | |
| | | Undulating 8 - 15% | 3 | |
| | | Somewhat Steep, Wavy, Hilly 15 - 25% | 2 | |
| | | Steep - Very Steep 25 - 45% | 1 | |
| 3 | Soil Type | Cambisol | 3 | 10 |
| | | Litosol | 4 | |
| | | Rendzinal | 5 | |
| | | Aluvial | 4 | |
| 4 | River Buffer | < 25 m | 5 | 20 |
| | | 25 - 50 m | 4 | |
| | | 50 - 75 m | 3 | |
| | | 75 - 100 m | 2 | |
| | | >100 m | 1 | |
| 5 | Land Use | Water Body | 5 | 25 |
| | | Open Land | 4 | |
| | | Field, Farm, Garden | 3 | |
| | | Forest | 2 | |
| | | Settlement | 1 | |
| 6 | Rainfall | >3000 mm/bulan | 5 | 15 |

Source: (Mudashiru et al., 2021; Msabi & Makonyo, 2021)

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spatial pattern map, to determine the type of spatial pattern affected by flooding in Ambon City.

The results of this analysis provide useful information to formulate recommendations for more effective spatial planning, including the development of drainage infrastructure and land use management, to improve the resilience of the area to flood disasters in Ambon City.

## C. RESULT AND DISCUSSION

### C.1. RESULT

### Flood Hazard

In general, areas that have high flood potential are areas located at an altitude of <10 meters above sea level, flat and sloping landforms, and soil types dominated by Litosol and Rendzinal soil types, which have low permeability properties, so that flowing rainwater cannot be absorbed by the soil and easily flows into waterways (Latue & Rakuasa,2023). This causes excessive rainwater to flow into the surrounding environment and trigger flooding. Therefore, areas that have this type have the potential to be flooded. Flood-prone areas in Ambon City are generally areas located close to rivers (>25 m). This is supported by the opinion of Sugandhi et a., (2023), who said that the closer an area is to a river, the higher the likelihood that the area will be flooded when the river overflows or when there is high rainfall around the river area. Therefore, areas close to the river tend to be more prone to flooding than areas far from the river.

**Table 2. Flood Hazardd Area Per Sub-District in Ambon City**

| No | Sub-district | Area (ha) | | |
|---|---|---|---|---|
| | | High | Medium | Low |
| 1 | Sirimau | 409.10 | 1.793.19 | 1.986.81 |
| 2 | Nusaniwe | 79.62 | 1.765. 36 | 3.135.61 |
| 3 | Teluk Ambon | 691.76 | 3112.67 | 1.0031.02 |
| 4 | Teluk Baguala | 632.71 | 1.956.96 | 3.682.41 |
| 5 | Leitimur Selatan | 19.88 | 1.244.65 | 3.625.41 |
| | Total | 1.833.07 | 9.872.83 | 22.461.27 |

(Source: Processed by the author, 2025)

High rainfall and the type of land use consisting of water bodies, open land, fields, moorlands, gardens, and settlements are the factors that most influence the level of flood-prone areas. According to Maryono, (2020), irresponsible land use can reduce the basic capacity to hold rainwater, so that rainwater that is not properly absorbed will flow into the surrounding area and cause flooding. Some examples of land use that become flood-prone factors are illegal logging, residential development without a good drainage plan, and road

construction that does not pay attention to the principles of water management (Desalegn & Mulu, 2021). Therefore, land use must be carried out by paying attention to the principles of good land management and considering environmental impacts so as not to cause flooding problems.

The research results in Figure 1 and Table 2 show that the Flood Hazardd class in Ambon City is dominated by the low class with an area of 22,461.27 ha, the medium class covering 9,872.83 ha, and the high class covering 1,833.07 ha. Based on Table 2, it is known that the Teluk Ambon sub-district has the highest percentage of area in the high Flood Hazardd class, which is 691.76 ha, followed by the Teluk Ambon Baguala sub-district, which is 632.71 ha, the Sirimau sub-district, which is 409.10 ha, the Nusaniwe sub-district, which is 79.62 ha, and the South Leitimur sub-district, which is 19.88 ha. Floods in Ambon City usually occur in coastal areas.

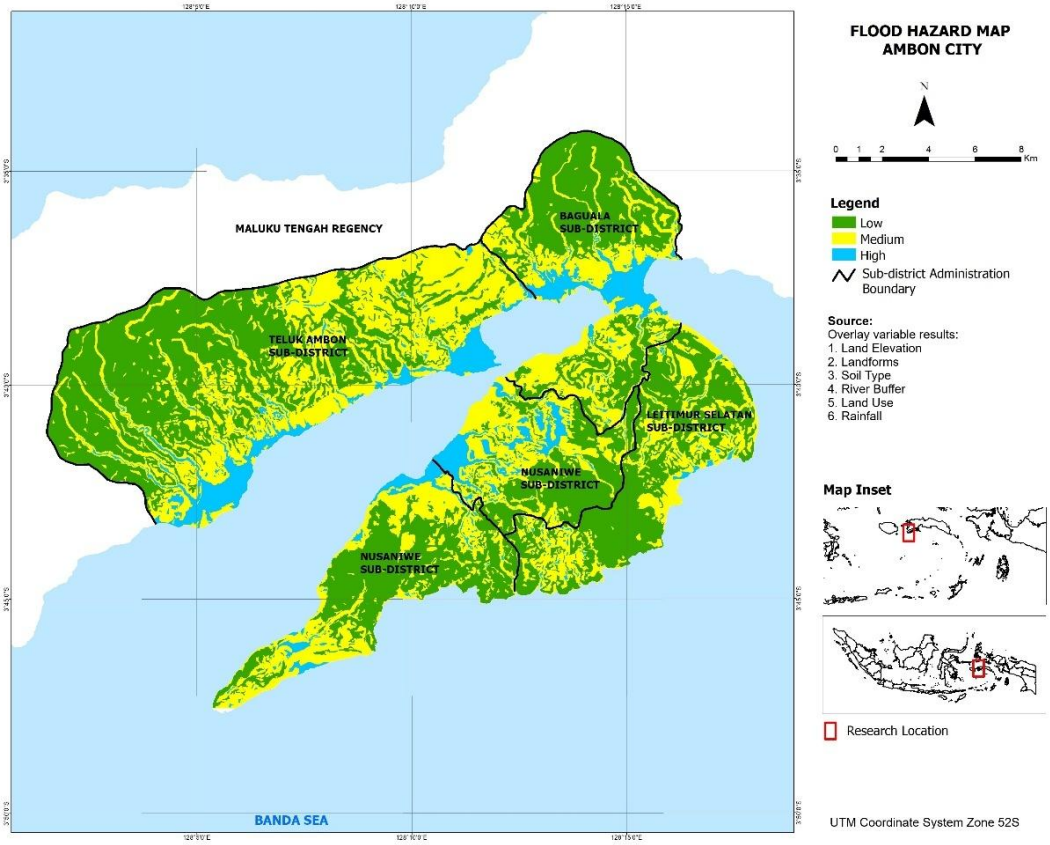


**Figure 1. Flood Hazardd Map of Ambon City**

(Source: Processed by the author, 2025)

According to Renschler & Wang, (2017), coastal areas tend to be prone to flooding due to tides, large waves, and tropical storms. When seawater rises, it can flood coastal areas and cause flooding. Low-lying areas are also prone

to flooding due to continuous rainfall. Rainwater will flow into rivers and reservoirs; if the volume of water exceeds the capacity of the reservoir, flooding will occur (Samantaray et al., 2021). According to Allafta & Opp, (2021), mountain slope areas are prone to flooding due to soil avalanches and rock collapse. During heavy rainfall, rainwater can accumulate on mountain slopes and cause flooding. Riverine areas: Areas along rivers are prone to flooding because river water can overflow and flood surrounding areas. Urban areas such as Ambon City tend to have hard ground surfaces that make it difficult for rainwater to absorb into the ground. This can cause water to flow into waterways and rivers, which can overflow and cause flooding.

**Flood Affected Settlements**

Flood-affected settlements are settlements located in areas that are vulnerable to flooding, either because they are located in lowlands, close to rivers or lakes, or areas that have high rainfall patterns (Nsangou et al., 2021). Floods can submerge settlements, inundate homes, and cause damage to buildings and property inside. Floods can also carry materials such as mud, garbage, and waste that can cause health and environmental problems (Chen, 2022).

The results of the Flood Hazardd analysis of Ambon City are then overlaid with settlement data in Ambon City in 2024 in Figure 2. Settlements affected by flooding can have a very detrimental impact on their residents, including material losses, health risks, social losses, environmental damage, and safety risks. 50.08% or 2,222.06 ha of settlements in Ambon City are predicted to be affected by flooding in the high class, 49.91% or 2,214.67 ha of settlements are predicted to be affected by flooding in the medium class, and 0.01% or 0.39 ha in the low class. Flood-affected settlements usually require special attention in planning and management. Governments and communities need to work together to reduce flood risk and strengthen the resilience of settlements to natural disasters (Rakuasa, 2024). This can be done by building good infrastructure and drainage systems, reducing excessive consumption patterns that can damage the environment, and educating the community on how to properly manage garbage and waste so as not to contribute to flooding (Klipper et al., 2021).

**Evaluation of Ambon City Spatial Plan Based on Flood Vulnerability Aspects**

The Ambon City Spatial Plan 2011-2031 is a spatial plan for Ambon City that was prepared for the period 2011 to 2031. RTRW is a comprehensive plan that regulates the spatial planning of Ambon city, including regional development, settlement, transportation, environment, tourism, and so on. The 2011-2031 RTRW contains the vision, mission and development strategy of Ambon city in

the long term. RTRW also identifies potentials and challenges in the development of Ambon city and provides guidelines for the government and community in implementing planned and sustainable development. Based on Ambon City Regional Regulation No. 24/2011 on the Regional Spatial Plan (RTRW) of Ambon City 2011-2031, it is explained that some of the focuses in the RTRW of Ambon City 2011-2031 include the development of environmentally friendly infrastructure and transportation, sustainable tourism development, development of comfortable and healthy residential areas, as well as environmental protection and sustainability of natural resources (Peraturan Daerah Kota Ambon Nomor 24 Tahun 2011 Tentang Rencana Tata Ruang Wilayah (RTRW) Kota Ambon Tahun 2011-2031, 2011).

**Evaluation of Ambon City Spatial Plan Based on Flood Vulnerability Aspects**

In the Ambon City Regional Regulation Number 24 of 2011 concerning the Regional Spatial Plan (RTRW) of Ambon City Year 2011-2031, it is explained that the spatial pattern is the layout and use of land in a certain area or area. The spatial pattern includes various aspects such as land allocation for settlements, industry, trade, transportation, tourism, and green or protected areas. The spatial pattern also includes infrastructure development plans, road and building layouts, and building height regulations. The spatial pattern of Ambon City is designed to create a functional, aesthetic, and sustainable spatial layout so that it can meet the needs of the community and support economic growth in a balanced manner. The Ambon City Spatial Pattern consists of 17 areas, including agrotourism, protected forest, airport area, military area, mangrove beach area, port area, quarry area, office area, marine tourism area, public services, buffer, trade and services, low-density settlements, medium-density settlements, high-density settlements, agriculture, and green open space. Spatially can be seen in Figure 3.

Evaluating the Spatial Plan (RTR) is an important step to ensure that the development of a region or area is carried out in a planned, coordinated, and sustainable manner (Haris et al., 2022). Evaluating the 2011-2031 Ambon City Spatial Plan (RTRW) needs to be revised to prevent overlapping land use, ensure effective and efficient land use, improve environmental quality, ensure community participation, and improve policy effectiveness. Evaluating the 2011-2031 Ambon City Spatial Plan (RTRW) based on flood vulnerability in Ambon City is very important to do because flooding is one of the natural disasters that often occur in Ambon City and can cause serious damage to the community and the environment.

According to Rahmati & Pourghasemi, (2017), by identifying areas vulnerable to flooding, better spatial planning can be done to reduce flood risks and impacts. Evaluation of spatial plans can help optimize land use and improve drainage infrastructure and waterways so that they can accommodate greater stormwater flows and reduce the impact of flooding. In addition, an evaluation of spatial plans that includes a flood risk analysis can also strengthen early warning systems and community preparedness for flooding. This can help reduce losses and prevent loss of life due to floods. In the long term, a sustainable spatial plan evaluation can help create a safer and more sustainable environment for the people of Ambon City, as well as support sustainable economic growth and better infrastructure development (Muin et al., 2023).

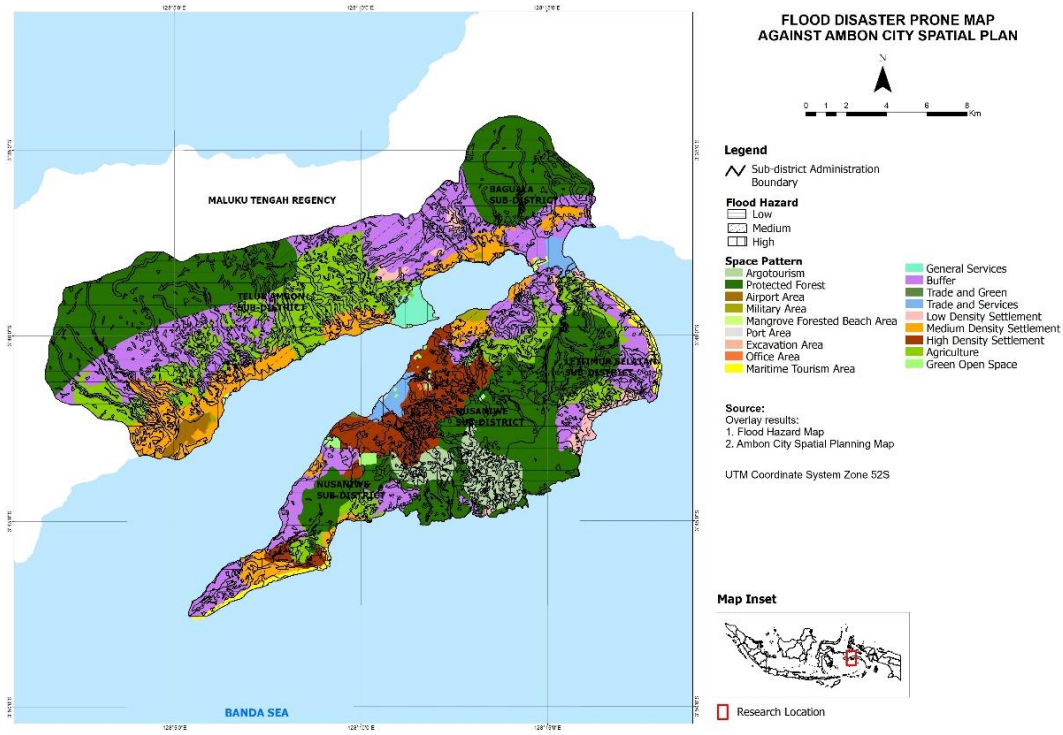


**Figure 4. Flood Disaster Prone Map Against Ambon City Spatial Plain**

(Source: Processed by the author, 2025)

The Flood Hazardd map of Ambon City was then overlaid with the spatial plan map of Ambon City to determine the extent of flood-prone areas based on the existing spatial pattern. The results of the Spatial Plan analysis of landslide prone areas show that the spatial plan has a landslide potential of low, medium, high and very high, while the dominant one is medium (Table 3). The results of the spatial plan analysis of flood-prone areas are an effort to control the utilization of flood-prone areas. Control of spatial utilization is in line with the RTRW, so

that Ambon City can carry out its functions and roles properly. The spatial pattern that has the most potential for landslides is medium-density settlements in the high class. This is also in accordance with the occurrence of landslides that have occurred in the spatial pattern based on data on landslide disasters according to BPBD Ambon City. This can occur because the RTRW planned by the government has not been realized on land use due to human activities.

**Table 3. Distribution Area of Flood Affected Spatial Patterns Based on Spatial Patterns**

| Space Pattern. | Extent of Flood Hazardd Level (Ha) | | |
|---|---|---|---|
| | Low | Medium | High |
| Agrotourism | 1022.94 | 185.29 | 0.04 |
| Protected Forest | 1.0418.16 | 1.339.46 | 16.70 |
| Airport Area | - | 190.29 | 8.07 |
| Military Area | - | 92.13 | 10.53 |
| Mangrove Coastal Area | - | 29.92 | 32.29 |
| Port Area | - | 6.49 | 7.99 |
| Excavation Area | 21.65 | 20.73 | 5.23 |
| Office Area | - | 23.24 | - |
| Marine Tourism Area | 26.10 | 392.21 | 4.63 |
| Public Services | 2.18 | 42.42 | 250.95 |
| Buffers | 5.127.05 | 2160.61 | 240.41 |
| Trade and Services | - | 178.49 | 323.16 |
| Low Density Settlement | 174.29 | 306.98 | 9.58 |
| Medium Density Settlement | 949.83 | 1.899.45 | 532.78 |
| High Density Settlement | 670.28 | 1.682.72 | 290.90 |
| Agriculture | 4.074.65 | 1.269.51 | 96.20 |
| Green Open Space | 79.40 | 53.58 | 13.82 |

(Source: Processed by the author, 2025)

The spatial pattern that has the largest presentation affected by flooding in the high class is the medium-density residential area of 532.78 ha, followed by the trade and service area of 323.16 ha and the high-density residential area of 290.90 ha. In the moderate Flood Hazardd class, the spatial patterns that have the largest presentation of being affected are medium-density settlements covering an area of 1,899.45 ha and high-density settlements covering an area of 1,682.72 ha, while in

the low class, the spatial patterns predicted to be affected are buffer areas covering an area of 5,127.05 ha and agricultural areas covering an area of 4,074.65 ha. Details of the distribution of flood-affected areas based on spatial patterns in Ambon City can be seen in Table 3. Residential areas that are not in accordance with the spatial plan affected by flooding in the low class are 0.23 ha, in the medium class are 742.27 ha, and in the high class are 402.96 ha.

Spatial Plan Conforming Settlements affected by flooding in the low class are 0.16 ha, in the medium class are 1,472.39 ha, and in the high class are 1,819.10 ha. RTRW settlements affected by flooding in the low class are 1,073.05 ha, in the medium class are 3,722.45 ha, and in the high class are 2,141.84 ha.

**C.2. DISCUSSIONS**

The evaluation of Ambon City's spatial plan (RTRW) based on flood vulnerability aspects has several important benefits that can improve the resilience and sustainability of the region. First, the evaluation helps to identify areas that are vulnerable to flooding, so that the government and community can take more effective preventive measures (Efraimidou & Spiliotis, 2024). By knowing the locations at risk, infrastructure planning, such as drainage channels and stormwater management, can be done more precisely, reducing the likelihood of damaging floods. Secondly, the RTRW evaluation also contributes to better land use management. By considering flood vulnerability, land use can be adjusted to avoid development in high-risk areas. This not only protects communities from the impacts of flooding but also safeguards environmental quality by preventing damage to ecosystems that can occur due to unplanned development. Wiser land use will support environmental sustainability and reduce negative impacts on local ecosystems (Monfared et al., 2024).

This evaluation encourages community participation in the planning process. By involving communities in discussions on flood vulnerability and spatial planning, their aspirations and needs can be accommodated. Community participation not only increases transparency and accountability in decision-making but also builds community awareness and preparedness for flood risks (Chen et al., 2019). This is important for creating more resilient and disaster-prepared communities. Fourth, another benefit of evaluating spatial plans based on flood vulnerability is the improvement of policy and planning effectiveness. With clear data and analysis on flood vulnerability, the government can formulate policies that are more targeted and responsive to community needs. It can also help in allocating resources more efficiently for disaster mitigation, thereby reducing the economic and social losses caused by flooding (Zhang et al., 2020). Overall, a spatial plan evaluation that

considers flood vulnerability aspects is essential for creating a safer and more sustainable city.

Future policy recommendations to address flood vulnerability in Ambon City include strengthening drainage infrastructure. The government needs to conduct a thorough audit of the existing drainage system and identify waterlogging hotspots. Investment in the repair and construction of more efficient drainage channels, as well as regular maintenance, is essential to ensure that rainwater flows can be properly accommodated. In addition, the construction of infiltration wells and retention ponds can also be a solution to reduce the volume of water flowing into drainage channels during heavy rains. Furthermore, stricter land use policies need to be implemented . The government should establish clear zoning for areas at high risk of flooding so that new infrastructure and settlement development can be avoided in these locations (Shreevastav et al., 2022). In addition, there needs to be incentives for developers to build in safer and more environmentally friendly areas. This policy will not only protect communities from flood risks but will also maintain environmental sustainability and prevent damage to ecosystems (Rakuasa & Khromykh, 2025). It is also important to increase public awareness and participation in flood mitigation efforts (Latue et al., 2024). The government can launch educational programs that explain flood risks and preventive measures that can be taken by individuals and communities. Involving the community in environmental maintenance activities, such as tree planting and cleaning drains, can increase a sense of ownership and responsibility for the environment (Park & Lee, 2019; Qasimi et al., 2024). As such, communities will be more prepared and proactive in dealing with potential disasters. Finally, collaboration between the government, communities, and the private sector must be strengthened to create a comprehensive approach to address flood vulnerability (Waqas et al., 2021; Kailola et al., 2023). The establishment of forums or working groups involving various stakeholders can help in formulating more effective and responsive policies. In addition, the use of information technology and geospatial-based monitoring systems can help in making better and faster decisions in dealing with emergency situations. With these measures, it is hoped that Ambon City can become more resilient to future flood threats.

## D. CONCLUSION

The conclusion of this research shows that the evaluation of Ambon City's Regional Spatial Plan (RTRW) based on flood vulnerability provides a comprehensive assessment of the existing conditions and projected flood risks in the region. The results of the analysis show that the Flood Hazardd class in Ambon

City is dominated by the low category, but there are areas with medium and high risk that require more attention. With 50.08% of settlements predicted to be affected by flooding in the high class, it is important to understand that although most areas are safe, there are critical points that could potentially cause major losses to the community.

Based on the evaluation results, more specific recommendations need to be implemented to address flood vulnerability in Ambon City. First, strengthening drainage infrastructure should be a priority, including a thorough audit of the existing drainage system and identification of inundation hotspots. In addition, the construction of infiltration wells and retention ponds can be an effective solution to reduce the volume of water flowing into drainage channels during heavy rains. Secondly, strict zoning for high flood risk areas is essential so that new infrastructure and settlement development can be avoided in vulnerable locations. Finally, community participation in the spatial planning process should be enhanced to ensure that their aspirations and needs are accommodated.

By involving communities in discussions on flood vulnerability and spatial planning, transparency and accountability in decision-making can be improved. This will not only build community awareness and preparedness for flood risks but also create communities that are more resilient and prepared for future disasters. With these measures, Ambon City is expected to increase its resilience to floods and achieve greater environmental sustainability.

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