Flood Mitigation Strategies in Rajabasa Subdistrict, Bandar Lampung and Analysis of On-Site Flood Conditions

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Abstract

Flood disasters frequently occur in Rajabasa Village, Bandar Lampung, particularly during periods of intense rainfall. This study seeks to examine the primary causes of flooding and assess mitigation strategies that can be implemented using spatial planning and community engagement approaches. The research methods include spatial analysis, interviews with local residents, and hydrological modeling through HEC-RAS software. Findings reveal that the main causes of flooding are inadequate drainage infrastructure, land use change, and waste-induced waterway blockages. Therefore, enhancing drainage capacity, promoting riverbank vegetation, and fostering public awareness on environmental cleanliness are essential mitigation efforts.

Keywords: *Mapping, Remote Sensing, Geographic Information Systems (GIS)*

I. INTRODUCTION

Flooding constitutes a recurrent natural hazard in Rajabasa Subdistrict, Bandar Lampung City, particulary during periods of high-intensity rainfall.

This issue is significantly aggravated by the limited capacity of the local drainage infrastructure to accommodate excessive water flow. In addition, the conversion of natural water catchment areas into residential developments and the persistently low levels of public awareness regarding proper waste disposal practices have further intensified flood vulnerability. The consequences of flooding are multifaceted, encompassing not only structural damage to residential buildings and public infrastructure, but also considerable disruptions to the socio-economic activities of the affected communities. Prolonged inundation in several low-lying areas has led to substantial material losses and a marked decline in living standards.

In light of these challenges, there is a pressing need for the implementation of long-term and sustainable flood mitigation strategies. A spatial planning approach that integrates considerations of hydrological capacity, along with the enhancement of drainage systems, offers a promising direction. Furthermore, public education and the active participation of local communities in environmental management are critical components in fostering flood resilience. This study seeks to identify the principal causes of flooding in the study area, to evaluate existing mitigation efforts, and to formulate spatially-informed policy recommendations aimed at developing a more disaster-resilient urban environment.

II. RESEARCH METHODOLOGY

This study adopts a mixed-methods approach, combining both qualitative descriptive and quantitative techniques to investigate the causes of flooding and to evaluate potential mitigation measures. The methods employed include spatial analysis, interviews with affected residents, and hydrological modeling using the HEC-RAS software. Spatial analysis was conducted utilizing satellite imagery, field surveys, and thematic maps such as topographic maps, land use maps, and administrative boundary maps of the study area. nterviews were carried out with community members frequently affected by flooding, as well as with relevant stakeholders including local government officials and

technical agencies, to obtain insights into both the contributing factors and institutional responses to flood events. To strengthen the analysis, hydrodynamic simulations were performed using HEC-RAS, taking into account rainfall intensity, drainage system capacity, and the river's morphological characteristics within the study area. This integrated approach is intended to provide a more comprehensive understanding, serving as a basis for formulating realistic and sustainable flood mitigation recommendations.

III. Results and Discussions

Results The findings of this study indicate that flooding in Rajabasa Subdistrict, Bandar Lampung, is driven by multiple interrelated factors, including suboptimal drainage infrastructure, land-use conversion, and the clogging of waterways due to unmanaged waste. Spatial analysis through flood-prone area mapping identified several zones with high susceptibility to flooding, marked in red on the map.

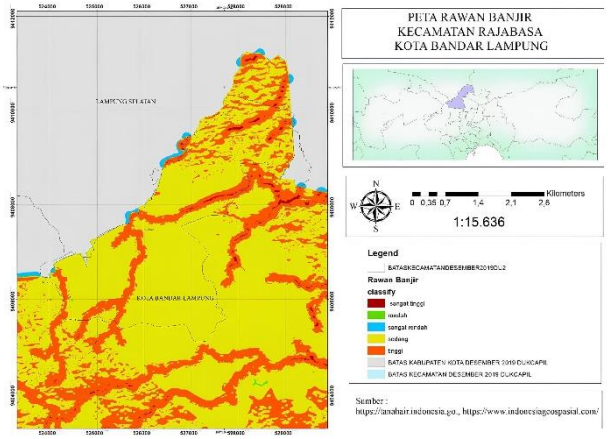

Figure 1. Flood-prone map of Rajabasa District, Bandar Lampung

The flood hazard map of Rajabasa Subdistrict reveals that high-risk areas are concentrated in specific locations, particularly those characterized by dense residential development and inadequate drainage systems. Several alleys identified as frequently affected include:

1. **Gang Ibrahim** (Rajabasa Induk Subdistrict): Flooding affected approximately 30 houses.

Figure 2. Ibrahim Alley, Rajabasa Induk Subdistrict

2. **Gang Toyib** (Rajabasa Induk Subdistrict): Affected by flooding primarily due to poor drainage conditions.

Figure 3. Toyib Alley, Rajabasa Induk Subdistrict

3. **Gang Haji Ismail** (Rajabasa Nunyai Subdistrict): Previously visited by the Acting Governor of Lampung to assess flood-prone conditions and prioritize river flow improvements.

Figure 4. Haji Ismail Alley, Rajabasa Nyunyai Subdistrict

4. **Gang Gang Marga Anak Tuha** (Rajabasa Raya Subdistrict): Experienced flooding that inundated dozens of homes and boarding houses.

Figure 5. Marga Anak Tuha Alley, Rajabasa Raya Subdistrict

5. **Gang Nunyai** (Rajabasa Subdistrict): Identified as a high-risk flood zone**.**

Figure 6. Nyunyai Alley, Rajabasa Subdistrict

6. **Gang Gelora** Persada (Rajabasa Raya Subdistrict): Classified as a critically flood-prone area.

Figure 7. Gelora Persada Alley, Rajabasa Subdistrict

Interviews with local residents revealed that the primary causes of flooding include poor rainwater management, high sedimentation in drainage channels, and low levels of public awareness regarding environmental sanitation. Many drainage pathways were found to be obstructed by domestic waste, leading to reduced water flow and widespread inundation.

In addition, land-use change-from natural infiltration areas to built-up residential and commercial zones-has exacerbated the flood risks. Land previously capable of absorbing rainfall is now covered by impervious infrastructure, resulting in increased surface runoff and reduced water retention capacity.

Mitigation Strategies

To reduce flood risk in Rajabasa Subdistrict, several mitigation measures are proposed:

1. Revitalization of Drainage Channels Normalization and widening of drainage networks to increase water-carrying capacity and reduce sediment buildup.
2. Riverbank Greening Initiatives Planting water-absorbent vegetation along riverbanks to minimize runoff and restore ecological function.
3. Environmental Literacy Improvement Ongoing community education on waste management and the importance of maintaining environmental cleanliness.
4. Disaster-Responsive Spatial Planning Development of spatial plans that integrate flood retention zones and early warning systems.

Hydrological simulations conducted using the HEC-RAS software suggest the necessity of redesigning the main water channels and constructing retention basins to accommodate peak runoff during heavy rainfall events. The success of these strategies depends heavily on coordinated efforts among local governments, community stakeholders, and academic institutions.

IV. CONCLUSIONS

This study concludes that flooding in Rajabasa Nunyai Subdistrict results from a combination of natural factors and anthropogenic activities. The primary contributing factors include inadequate drainage infrastructure, uncontrolled land-use conversion, and limited public awareness regarding environmental stewardship. Areas identified as most vulnerable are typically densely populated neighborhoods with insufficient drainage facilities. To mitigate flood risks, an integrated strategy is required-encompassing drainage system improvement, land-use regulation, community awareness enhancement, and the implementation of early warning systems. Active community participation emerges as a critical component in developing sustainable, long-term solutions.

RECOMMENDATIONS

In future flood hazard mapping, it is recommended to incorporate additional parameters such as soil type and proximity to river flow (buffer zones). Field validation is necessary to ensure the accuracy of inundation locations as indicated by the spatial data. Administrative boundary mapping should be represented in polygon format to clarify the spatial extent of the analysis.

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