# Warning in the Clouds: Predicting Flood Threats Through Rainfall-Based Mathematical Approach in Tanjay City

**DOI: 10.5281/zenodo.18444544**

**Stephen J. Torres**
Tanjay City Science High School, Tanjay City Division, Negros Oriental, Philippines
**Shanielle A. Gaso**
Tanjay City Science High School, Tanjay City Division, Negros Oriental, Philippines
**Ericha S. Ablen**
Tanjay City Science High School, Tanjay City Division, Negros Oriental, Philippines

**Abstract**

Flooding poses a severe and recurrent threat to communities in Tanjay City, Philippines, frequently disrupting critical infrastructure such as schools. This study developed and applied a computational model to quantitatively predict flood likelihood in six selected barangays, with particular focus on the locale of Tanjay City Science High School. Using a mathematical formula that integrates rainfall intensity (R), duration (T), and frequency (D) with key environmental parameters: soil coefficient (S), elevation (E), and drainage capacity (DR). This research calculated flood susceptibility values across seven recorded rainfall events during a one-month observational period. The formula applied was $FL = \frac{R \times D \times S}{T \times E^{0.5} \times DR}$. The results demonstrated pronounced spatial disparities in flood risk. Barangay Luca consistently registered the highest flood likelihood, peaking at a value of 4.01, while the school's barangay reached 3.35, indicating a tangible threat. The analysis confirms that floods are not caused by rainfalls alone but also depend on localized factors. Areas characterized by lower elevation, clay-rich soils with low permeability and insufficient drainage systems attributes of both Luca and the school's barangay are inherently more prone to flooding. These findings provide empirical, data-driven validation of the flooding hazard facing Tanjay City Science High School. The study concludes that effective risk reduction requires targeted interventions prior to these specific geophysical vulnerabilities. Immediate recommendations include upgrading drainage infrastructure, implementing real-time water level monitoring, and formalizing school-specific flood preparedness protocols. This computational approach offers a replicable framework for evidence-based urban planning and prioritization of mitigation resources in flood-prone communities.

Keywords: Flood susceptibility, Computational modelling, Risk assessment, Rainfall threshold, Drainage coefficient, Mitigation planning

## Introduction

Flood prediction has heavily relied on mathematical and computational models that merge rainfall data with environmental variables to estimate flood risk. Globally, rainfall is one of the primary factors of flooding. However, research highlights that flooding is not only caused by rainfall alone but by the interaction of rainfall with soil conditions, elevation, drainage efficiency, and continuous moisture (Wasko & Nathan, 2019). Because of this ongoing problem, flood likelihood models are made to combine multiple variables rather than relying on rainfall data alone. Rainfall amount (R) is a fundamental variable in modelling flood formulas, due to having higher rainfall volumes directly increase the occurrence of excess water which affects the probability of flooding. A global study by Liu et al. (2024) that analyzed flood events from 1990 to 2022, concluded that extreme levels of rainfall events are the main roots of increasing flood impacts worldwide. Similarly, Haslinger et al. (2025) illustrated that intense rainfall due to climate change has resulted in higher flood magnitudes, especially in low-lying areas. These findings support the addition of rainfall as a key component for the formula of flood likelihood.

In addition to rainfall amount, the duration of the rain (T) and the consecutive days (D)s greatly influenced the flood occurrence. Wasko and Nathan (2019) explained that recurring rainfall events influence the soil saturation, reducing the ability of the soil to penetrate water that causes overflow even in moderate rainfall. This justifies the inclusion of rainfall frequency in flood prediction formulas, as former rainfall conditions strongly affect the potential of a flood event. For the rainfall duration, it plays a significant role in flood generation. Prolonged rainfall events allow water to accumulate over time, clogging drainage systems and increasing flood risk. According to the Global Facility for Disaster Reduction and Recovery (GFDRR, 2017), flooding in urban areas is often associated with longer duration of rainfall combined with poor drainage infrastructure, particularly in developing countries. Environmental factors that further contribute to flood sensitivity. Soil type or permeability (S) affects how quickly water infiltrates the ground. Wasko & Nathan (2019) found that clay-rich and less permeable soils retain water, which increases water overflowing and flood likelihood, while sandy soils allow greater infiltration. As a result, flood models assign soil coefficients to soil in the formulation to the formula to represent the differences between each type of soil in terms of permeability.

Elevation (E) is another equally important variable that affects flood risk. Research has indicated that flood-prone areas will experience flooding as a result of natural water accumulation and lack of gravitational drainage in areas of lower elevation (Kundzewicz et al., 2014). To avoid elevation becoming overly dominant in flood calculations, its effect is muted through mathematical functions that take its effect into consideration. Drainage condition (DR) is an index of the efficiency of natural and engineered systems to remove excess water. Anticipation Hub (n.d.) noted that a poor drainage system is one of the factors that increase flood risks. It is important to mention that in the Philippine situation, a poor drainage system can increase the negative impacts of flooding due to improperly planned infrastructures, as noted by Lagmay (2025). This is a justification for employing drainage coefficients in flood likelihood estimations. Upon these hydrological principles, the model for flood likelihood in this research combines rainfall amount, rainfall frequency, rainfall duration, permeability, elevation, and drainage conditions into an equation. This practice is in standard procedures for rainfall threshold and susceptibility models, given that rainfall factors are combined for a better estimation of the likelihood of flooding (World Meteorological Organization [WMO], 2021).

In the local context of Tanjay City, where flooding frequently affects low-lying barangays with poor drainage systems, this rainfall-based mathematical approach provides a practical and data-driven method for predicting flood likelihood. By grounding the model in established global, international, and local studies, the formula used in this research is scientifically justified and suitable for assessing flood risk in Tanjay City Science High School and nearby communities.

**Research Question**

This study aims to address the following questions:

1. What is the computed flood likelihood in each selected barangay based on the given variables?
2. How do rainfall amount, duration, and frequency affect flood likelihood in the school area?
3. How do soil type, elevation, and drainage conditions influence flooding in Tanjay City Science High School?

**Objectives of the Study**

This study aims to apply a computational model to forecast the risk of flooding in specific Tanjay City barangays and to propose measures to mitigate flooding at Tanjay City Science High School.

This study aims to:

1. Collect rainfall data and record the number of days with rainfall and the amount of rainfall in millimeters, prior to each rainfall occurrence.
2. Assign numerical values to each selected barangay based on soil type, ground elevation, and drainage condition.
3. Apply the flood likelihood formula $FL = \frac{R \times D \times S}{T \times E^{0.5} \times DR}$ to each rainfall event during the one-month study period.
4. Compute and compare flood likelihood values across the selected barangays.

5. Determine the flood risk level at Tanjay City Science High School using the computed results.
6. Use the study's findings to recommend appropriate flood-mitigation and preparedness measures for the school.

**Literature Review**

A flood is a natural phenomenon involving the persistent overflow of a large volume of water, typically triggered when heavy rainfall exceeds the absorption capacity of the local terrain and soil, as stated by Swain, Singha, & Nayak (2020). Studies indicate that over one-third of the world's land area is prone to flooding, a hazard that impacts approximately 82% of the global population. As reported by Abdulrazzak et al. (2019). Flooding is among the most destructive natural disasters, causing fatalities and endangering multiple sectors. The three primary types are river floods, coastal floods, and flash floods. This impact is particularly severe in developing countries due to inadequate infrastructure and limited financial and technical resources to manage such devastating events. This is even more severe in developing countries due to their lack of standard infrastructure, ill-equipped and limited financial and technical resources to handle such devastating events, as noted by Echendu (2020).

Climate change has intensified extreme rainfall events, increasing flood risks worldwide. According to the study provided by Haslinger et al. (2025), significant increases in heavy rainfall in Austria, with hourly extremes rising by about 15% and daily extremes by 8%, are closely linked to rising temperatures. These changes were reflected in flood behavior, particularly in small catchments, which experienced larger increases in flood magnitude. However, evidence from the *Journal of Hydrology* suggests that increased rainfall intensity does not always lead to higher flood peaks. The study found that antecedent soil moisture and catchment conditions play a critical role in flood generation, as reduced soil moisture can offset the effects of extreme rainfall except during the most intense events. This underscores the complexity of rainfall-flood relationships. Additionally, continental-scale analyses reveal that trends in flood magnitude are highly heterogeneous and not clearly correlated with precipitation, emphasizing the critical mediating role of initial catchment wetness stated by Berghuijs et al. (2017); Bertola et al. (2020).

Effective assessment and management depend on the nature of the flood and require diverse information and techniques. According to Youssef et al (2016), Mahmood & Rahman (2019), and Hussain et al. (2021), these include hydrological, meteorological, geomorphological, and socio-economic data. On the authority of Hussain et al. (2020), while flooding is an inevitable and difficult-to-avoid natural event, appropriate analysis and susceptibility mapping techniques can effectively assess and manage future flood risks. Consequently, flood susceptibility maps are vital tools. Assisting in mitigation and planning by providing regional planners and decision-makers with a clearer understanding of the flood attributes, thus helping to ensure a more sustainable and safe future. Furthermore, robust early warning systems are essential for managing specific hazards like flash floods, according to Henao Selgado & Zambrano Nájera (2022).

However, recent developments in rainfall-based mathematical modeling show how crucial it is to incorporate statistical techniques to increase the precision of flood forecasts. Rainfall amount. Intensity and temporal distribution are used as the main predictors of flood occurrence in rainfall-driven models, such as multiple linear regression paired with entropy-based weighting techniques. By establishing quantifiable correlations between rainfall variables and flood probability, these mathematical techniques enable researchers to use both historical and current precipitation data to estimate flood dangers. Such rainfall-based mathematical frameworks are useful tools for flood risk assessment, especially in regions with inadequate hydrological monitoring infrastructure, according to Shi, Wu and Qin (2025). These models offer a useful and data-driven way to predict flood dangers and enable evidence-based disasters like Tanjay City, where rainfall variability has a significant impact on flood events.

Beyond physical impacts, floods pose serious socio-environmental and public health risks. Lagmay (2025) emphasized that poor infrastructure planning in the Philippines exacerbates the impacts of flooding and contributes to post-flood disease outbreaks, underscoring the need for integrated flood management and health-responsive infrastructure. Supporting this, the Anticipation Hub (n.d.) reported that floods affect multiple sectors, including housing, health, agriculture, and livelihoods, increasing community vulnerability. In accordance with Frometta &

Feyen (2019), UNDRR (2019), this multi-sectoral impact highlights the components of exposure and social vulnerability, which are key determinants of disaster risk alongside the physical hazard.

Furthermore, Kurata et al. (2023) found that flood preparedness and mitigation in flood-prone areas of the Philippines are strongly influenced by risk perception, coping appraisal, and behavioral intentions, stressing the importance of community awareness and proactive planning. Collectively, these studies demonstrate that flood impacts are shaped not only by climatic and hydrological factors but also by infrastructure quality, sectoral exposure, and human behavior, emphasizing the need for holistic flood risk reduction strategies. As stated by Ward et al. (2017), this aligns with integrated risk assessments that project future risk as a product of changing climate hazards and socio-economic exposure, calling for strategies that address this complete risk equation.

## Methodology

This study utilized a quantitative, computational research approach. In order to forecast flood likelihood using numerical rainfall and environmental data. A mathematical formula was applied to calculate flood likelihood values for selected barangays in Tanjay City using recorded rainfall data. Conducted in six selected barangays in Tanjay City, Negros Oriental, one of which is the location of Tanjay City Science High School. Despite the city having twenty-four barangays, only those exposed to flooding and relevant to the research objectives were selected. The study did not include surveys or experimental procedures; instead, it relied on data gathering, numerical transformation, and mathematical computation.

In computational research, rainfall can be analyzed using mathematical models to estimate the likelihood of flooding in selected barangays of Tanjay City. The flood Likelihood is computed using the formula:

$$FL = \frac{R \times D \times S}{T \times E^{0.5} \times DR}$$

Where:
**R** = Total rainfall for the event (mm)
**D** = Number of days with rainfall prior to the flooding event

**T** = Time interval/duration of the rainfall event (hours)
**E** = Elevation of the area (meters)
**S** = Soil coefficient (numeric) - represents permeability/saturation:
- Sandy, highly permeable = 0.75
- Loamy/medium = 1.15
- Clay/low permeable (holds water) = 1.75

**DR** = Drainage coefficient

## Definition and Source of Variables

Rainfall Variables (R, D, T)
The rainfall variables represent the amount, frequency, and duration of rainfall prior to a flooding event. The values are based on recorded rainfall data given by PAGASA (Philippine Atmospheric, Geophysical and Astronomical Services Administration, PAGASA, n.d.).

Elevation (E)
Elevation refers to the height of the area above sea level and affects how water accumulates in a location. In this study, each barangay was assigned a fixed elevation value derived from topographic data (Tanjay Topographic Map, n.d.). To limit its influence on the overall flood likelihood calculation, elevation was adjusted using a square root transformation (exponent of 0.5).

Soil Coefficient (S)

The soil coefficient represents the soil's ability to absorb water. Different soil types absorb water at different rates, which influences surface runoff and flooding. Based on the information from Tensar's article on soil permeability, soil types can be grouped into ranges of permeability. To make the model easier to use and fair for all barangays, only one value was chosen for each soil type. The value used was the middle or the midpoint of the given range to help represent soil behavior and allow fair comparison of flood likelihood among the selected barangays.

- Sandy Soil (high permeability) - 0.6 - 0.9, value used = 0.75
- Loamy Soil (medium permeability) - 1.0 - 1.3, value used = 1.15
- Clay Soil (low permeability) - 1.5 - 2.0, value used = 1.75

Drainage Coefficient (DR)
The drainage coefficient is the characteristic of the area and indicates its capacity for excess rainwater drainage. The drainage capacity can influence the drainage rate of water from the surface. As a result, drainage coefficients can be used in hydrology and drainage engineering to indicate the rate and efficiency of water drainage from the area. The area has low water accumulation if it has an effective drainage system. Also, if an area has an inefficient drainage system, it may easily flood (Jha & Yellareddy, n.d.).

From the literature in the fields of hydrologic and drainage engineering, the different conditions of draining can be categorized in terms of efficiency of draining (Jha & Yellareddy, n.d.). To ensure that the draining variable is treated fairly in the simulation so that the simulation output among different barangays may be comparable, for each draining situation, the value used is the one that is exactly at the middle of the draining range so that the draining situation of that barangay may be well-represented without being over-or under-stating the draining effect in the region of flood likelihood.

- Good Drainage (high drainage capacity) – 0.6 – 0.9, value used = 0.75
  Areas with well-developed drainage systems, presence of canals or storm drains, sloping terrain, and efficient runoff pathways.

- Moderate Drainage (medium drainage capacity) – 1.0 – 1.3, value used = 1.15
  Areas with some drainage infrastructure but limited capacity, moderate slopes, or partially obstructed drainage pathways.

- Poor Drainage (low drainage capacity) – 1.5 – 2.0, value used = 1.75
  Areas with flat terrain, inadequate or poorly maintained drainage systems, and slow water removal, leading to higher flood susceptibility.

By incorporating the drainage coefficient (DR) into the flood likelihood formula, the model accounts for variations in drainage efficiency across barangays (Jha & Yellareddy, n.d.). Since DR is placed in the denominator of the formula, areas with better drainage capacity result in lower flood likelihood values, while areas with poor drainage yield higher flood likelihood values under similar rainfall conditions.

**Results**

The flood likelihood formula presented in the Methodology section was used to calculate flood likelihood for each barangay and rainfall event. Six selected Tanjay City barangays, including the barangay where Tanjay City Science High School is located, recorded a total of seven rainfall events during the one-month study period. The results are presented by rainfall event and barangay to capture variations in flood likelihood across time and space.

To illustrate the computation process, a sample flood-likelihood calculation for Barangay Luca on September 1, 2025, is presented below.

**Given:**

- Total rainfall (R) = 2.2 mm
- Number of rainy days prior (D) = 1 day
- Soil coefficient (S) = 1.15
- Rain duration (T) = 5 hours
- Elevation (E) = 4.9 meters
- Drainage coefficient (DR) = 1.75

$$\square\square = \frac{\square \times \square \times \square}{\square \times \square^{0.5} \times \square\square}$$

$$FL = \frac{2.2 \times 1 \times 1.15}{5 \times 4.9^{0.5} \times 1.75}$$

$$\square\square = 0.13$$

Table 1. Computed Flood Likelihood Values per Barangay per Rainfall Event

| Rainfall Events | Luca | Novallas | Tugas | Santa Cruz Viejo | San Miguel | Poblacion 9 (Tanjay City Science High School) |
|---|---|---|---|---|---|---|
| December 1, 2025 | 0.13 | 0.09 | 0.08 | 0.10 | 0.05 | 0.11 |
| December 4, 2025 | 2.45 | 1.60 | 1.47 | 1.80 | 1.08 | 2.05 |
| December 5, 2025 | 2.45 | 1.62 | 1.47 | 1.80 | 1.03 | 2.05 |
| December 6, 2025 | 1.72 | 1.14 | 1.03 | 1.27 | 0.72 | 1.44 |
| December 16, 2025 | 1.31 | 0.86 | 0.78 | 0.96 | 0.55 | 1.09 |
| December 19, 2025 | 4.01 | 2.64 | 2.40 | 2.95 | 1.68 | 3.35 |
| December 26, 2025 | 0.45 | 0.29 | 0.27 | 0.33 | 0.19 | 0.37 |

The table summarizes the computed flood likelihood values for the selected barangays during the recorded rainfall events in December 2025. These values represent the relative probability of flooding in each barangay for every rainfall event analyzed.

Among the barangays, Luca consistently records the highest flood likelihood values across all rainfall events, with the highest value observed being 4.01 on December 19, 2025. This indicates that Luca is the most flood-prone area, especially during periods of intense rainfall.

Tugas and Poblacion 9, where Tanjay City Science High School is located, also exhibit relatively high flood likelihood values, particularly during heavy rainfall events such as those on December 4 and 19, 2025. Notably, Poblacion 9 reached a peak flood likelihood value of 3.35 on December 19, suggesting a high vulnerability to flooding.

In contrast, Novallas and San Miguel consistently show the lowest flood likelihood values throughout the rainfall events, indicating a comparatively lower flood risk than the other barangays. Santa Cruz Viejo displays moderate flood likelihood values, placing it between the high-risk barangays (Luca, Tugas, and Poblacion 9) and the low-risk barangays (Novallas and San Miguel).

Overall, the results indicate that flood likelihood generally increases during more intense rainfall events, with December 19, 2025, producing the highest flood likelihood values across most barangays.

**Risk Level Interpretation Table**

Table 2. Flood Likelihood Risk Level Classification

| Flood Likelihood (FL) Value | Interpretation | Meaning |
|---|---|---|
| FL < 1.0 | Very Low Risk | Flooding is unlikely |
| 1.0 ≤ FL < 5.0 | Low Risk | Minor Flooding Possible |
| 5.0 ≤ FL < 15.0 | Moderate Risk | Flooding Likely in Low Areas |
| 15.0 ≤ FL < 30.0 | High Risk | Significant Flooding Expected |
| FL ≥ 30.0 | Very High Risk | Severe Flooding Highly Likely |

For the interpretation of the calculated likelihood of floods, threshold levels were formed to define the levels of floods. Threshold levels provide a possibility to link the calculated numerical values of floods to the levels of floods. If the calculated likelihood of floods is less than 1.0, the level of floods will be very low. The likelihood of floods between 1.0 and 5.0 shows the level of floods is low. Minor floods may occur. Values between 5.0 and 15.0 will be moderate. Flooding is likely in low-lying areas. For values between 15.0 and 30.0, the level of floods is high. If the calculated likelihood of floods is greater than 30.0, the level of floods is very high.

This classification system is common to the techniques of flood hazard and flood susceptibility mapping. It is advisable to use these classifications for the interpretation and decision-making processes according to the World Meteorological Organization WMO (2021). It is also essential to consider the classifications according to the United Nations Office for Disaster Risk Reduction, UNDRR (2019).

In the same manner, another recent article from the journal Scientific Reports (Shi, Wu, & Qin, 2025) was utilized in ranking the continued probability of flood events into different levels for proper measures to be taken for mitigation in flood areas. By incorporating different methods, the numerical value of the results from the computational models can yield reasonable and actionable data, especially for critical locations like the Tanjay City Science High School.

**Discussion**

Clearly, based on the results obtained from this study, flood occurrences in Tanjay City are a function of a combination or interaction between rainfall characteristics and environmental features. Rainfall volume, occurrence, and length positively and consistently contributed to flood occurrence in all barangays. These results agree with worldwide studies on flood occurrences, specifically that flood occurrences are not commonly brought about solely by rainfall but by a combination or interaction between meteorological and environmental variables (Wasko & Nathan, 2019; Haslinger et al., 2025). Recent studies also highlight that urban development and land use can further influence flood susceptibility, adding context to local environmental conditions (Worthington, 2024; Khodaei et al., 2025). Global flood risk assessments also emphasize the importance of prioritizing mitigation strategies in vulnerable areas, providing context for applying worldwide lessons locally (Bündnis Entwicklung Hilft & IFHV, 2023).

Of the indicated barangays, it is apparent that Luca had the highest values for flood likelihood, peaking at 4.01 on December 19, 2025, signifying that it is the flood-prone area when heavy rainfall occurs. Poblacion 9, which homes Tanjay City Science High School, is also flood-prone but to a certain extent, indicated by a flood likelihood value of 3.35 on December 19, 2025, categorizing it as having low to moderate flood risk (Kurata et al., 2023; Lagmay, 2025).

On the other hand, barangays like Novallas and San Miguel had the lowest flood values, signifying that flood risk is conditionally affected despite being within Tanjay City.

The antecedent rainfall was also a significant factor in enhancing the chances of flood occurrence in the barangays. The days with antecedent rainfall raised the saturation level of the soil, thus reducing its capacity to drain other rainfall, hence promoting runoff (Mwakala et al., 2009). The duration of rainfall also raised the chances of flood occurrence in the region because rainfall exceeded the drainage capacity of regions with high concentrations of impervious surfaces, such as in the case of Poblacion 9, which was a semi-urban region (Wasko & Nathan, 2019; GFDRR, 2017).

Another factor that greatly influenced the occurrences of floods in the barangays was the environmental characteristics of the area. The flatness of the barangays made water retention and increased flood risks evident (Kundzewicz et al., 2014). Finally, the soil found in barangays like Luca and Poblacion 9 that contain high levels of clay made water retention and runoff significantly higher compared to those with soil composed of sand and loams (Wasko & Nathan, 2019; Zamara, 2024). Another important factor was the drainage efficiency of the barangays. The barangays that do not have good drainage systems like barangays with high flood risks in Luca and Poblacion 9, always indicate higher flood risks compared to others with good drainage systems (Anticipation Hub, n. d., Lagmay, 2025; Singh et al., 2023).

Overall, these findings emphasize the complex interplay that exists between rainfall characteristics and the local environmental conditions that determine the vulnerability to flooding. The computational model used in this study captures this complexity well by integrating rainfall amount, frequency, and duration with soil permeability, elevation, and drainage into one single calculation of unified flood likelihood. This approach meets recommended standards for rainfall-threshold and flood susceptibility modeling, as stated by the World Meteorological Organization in 2021, and delivers practical insights to act upon by local stakeholders.

**Limitations of the Study**

Despite these findings, this study has several limitations. First, it was based on only seven rainfall events within one month, which may not fully represent overall trends and seasonal flooding patterns. Second, some variables, such as soil and drainage coefficients, were generalized to simplify calculations, even though these factors may vary across barangays. Third, the study did not consider tidal and river dynamics, which could influence flood characteristics in low-lying areas. Finally, the research focused mainly on the environmental and rainfall factors, excluding human influences such as urban planning and community flood preparedness.

Nevertheless, despite the study's limitations and challenges, it provides significant data on flood-prone areas in Tanjay City and priority zones for mitigation. These findings are invaluable in helping schools and the Tanjay City administration implement appropriate measures to prepare these areas for future flood occurrences.

## Conclusion

This study demonstrated that a computational approach can be effectively used to estimate flood likelihood in selected barangays of Tanjay City using rainfall and environmental data. By examining seven rainfall events over a one-month period, the study identified variations in flood vulnerability among different locations, providing valuable insights for local disaster risk assessment.

The findings revealed that Barangay Luca is the most flood-prone area, while Barangays Tugas and Poblacion 9, including Tanjay City Science High School, also experienced high flood likelihood during periods of intense rainfall. In contrast, Barangays Novallas and San Miguel consistently recorded lower flood likelihood values, indicating a relatively lower risk of flooding. These results emphasize the strong influence of rainfall intensity and frequency, as well as environmental factors such as soil type, elevation, and drainage conditions, on flood occurrence.

This study contributes to the community by identifying areas that require immediate attention, particularly schools and residential zones. The localized flood likelihood estimates can help residents, school administrators, and local authorities improve preparedness, minimize potential damage, and ensure student safety during heavy rainfall events. Moreover, the computational model serves as a practical tool for increasing awareness of flood risks within the community.

Based on the findings, the study recommends targeted flood mitigation measures, especially for Tanjay City Science High School. These include enhancing drainage systems, regularly clearing canals, improving surface water flow management, and integrating flood preparedness strategies such as early warning systems and evacuation procedures.

The results of this study support evidence-based decision-making by the local government in disaster risk reduction planning. By prioritizing high-risk barangays, agencies can allocate resources more efficiently for drainage rehabilitation, infrastructure improvement, and flood control initiatives. The findings also reinforce the implementation of community-based disaster risk reduction programs aligned with the Philippine Disaster Risk Reduction management.

Future research may improve flood prediction accuracy by extending the data collection period, including additional barangays, or incorporating other influencing factors such as tidal effects and land-use changes.

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