EXPLORING THE INTERPLAY BETWEEN FLOODING SUSCEPTIBILITY AND DISEASE OCCURRENCE IN ANAMBRA STATE: A GIS-BASED ANALYSIS

BACKGROUND INFORMATION

Anambra State, located in southeastern Nigeria, is subject to frequent flooding, particularly during the rainy season. This natural calamity has severely affected the lives of residents, causing significant damage to infrastructure, livelihoods, and public health. The "Exploring the Interplay Between Flooding Susceptibility and Disease Occurrence in Anambra State: A GIS-Based Analysis" project aims to investigate the intricate relationship between flooding and disease incidence in the area. The state's geographical location, seasonal rainfall patterns, and low-lying terrain have rendered some parts of Anambra State more vulnerable to flooding over time. Consequently, property damage, displacement, and potential public health concerns must be addressed.

The impact of disease in flood-prone areas is a major concern for local communities and public health systems. Flooding can lead to unsanitary conditions, heightened exposure to waterborne illnesses, and the displacement of individuals to crowded relief camps. These factors can create an environment that facilitates the spread of infectious diseases, compounding challenges posed by the floods themselves. Analyzing disease incidence in flood-affected regions can help identify possible links between these natural disasters and health outcomes. This is essential for guiding public health interventions and enhancing community resilience in the face of future flooding.

In order to effectively address the current challenges, it is crucial to carry out a comprehensive analysis that examines the vulnerability of Anambra State to flooding. Utilizing Geographic Information Systems (GIS) presents a robust method for mapping and comprehending flood-prone regions, taking into consideration a range of factors, including terrain, land usage, and past flood data. A comprehensive comprehension of flood susceptibility will establish the groundwork for efficient flood risk management and preparedness initiatives.

POTENTIAL DATA SOURCES

Data Sources:

For the proposed GIS-based analysis, I will be utilizing multiple reputable data sources to ensure accurate and reliable results. I have carefully chosen the following sources to provide comprehensive and up-to-date information for the study:

- **Digital Elevation Model (DEM) Data from Earth Explorer:**

The project has obtained Digital Elevation Model (DEM) data from Earth Explorer, a trusted source of earth science information. DEM data plays a critical role in analyzing the topography of the study area, which is a key factor in assessing flood vulnerability. The elevation data furnished will be utilized to produce comprehensive flood susceptibility maps.

- **Rainfall Data from CHRS Data Portal:**

Obtaining accurate precipitation data is critical in comprehending the rainfall patterns in Anambra State throughout the year. This invaluable data is sourced from the CHRS Data Portal. It plays a pivotal role in flood susceptibility analysis by allowing us to evaluate the likelihood of heavy rainfall occurrences aligning with flooding situations.

- **Land Use Data from ESRI:**

The information provided by ESRI's land use data is critical in comprehending how land is utilized in the study area. This data plays a significant role in assessing the potential for flooding and how different land uses may affect it. Furthermore, it aids in evaluating the impact of human activities on the risk of flooding.

PLANNED METHOD: ANALYZING FLOOD SUSCEPTIBILITY USING GIS

- **Data Acquisition:**

I will commence the analysis by acquiring essential data for Anambra State. The primary dataset will be the Digital Elevation Model (DEM) in TIFF format. Specifically, the raster data sets that will be used include:

- n05_e006_1arc_v3
- n05_e007_1arc_v3
- n06_e006_1arc_v3

- **Data Processing:**

Merging Raster Data: The acquired raster datasets will be merged to create a unified representation of the study area using the "Mosaic to New Raster" tool. This process will result in a seamless elevation model, which is a fundamental component of flood susceptibility assessment.

Study Area Boundary: To confine the analysis to the study area, I will create a shapefile delineating the geographical extent of our study. This shapefile will serve as the boundary for subsequent analysis.

Clipping Raster Data: To focus our analysis on the study area, the merged raster data will be clipped using the "Clip" tool, ensuring that our work is specific to the intended geographic region.

- **Flood Susceptibility Analysis:**

Fill Tool: The "Fill" tool will be applied to the clipped raster to ensure the removal of sinks and ensure a continuous flow pattern within the terrain.

Flow Direction Tool: I will determine the direction of flow across the study area using the "Flow Direction" tool, which is crucial for understanding how water moves across the landscape.

Flow Accumulation Tool: The "Flow Accumulation" tool will be employed, using the output raster from the flow direction analysis as the input. This will yield information on the accumulation of flow, aiding in the identification of potential flood-prone areas.

Raster Calculator: The "Raster Calculator" will be used to identify areas with flow accumulation values exceeding 500. This threshold is indicative of regions with a higher potential for flooding.

Stream to Feature Tool: I will convert the output from the Raster Calculator into a feature using the "Stream to Feature" tool, allowing for the representation of potential watercourses.

Stream Order Tool: Determining the stream order will classify these potential watercourses based on their hierarchical position within the river network.

Euclidean Distance: Using the "Euclidean Distance" tool, we will calculate the distance from the identified watercourses to any given point in the study area.

Flood Susceptibility Assessment: The Euclidean distance results will be integral to assessing flood susceptibility, with areas closer to the identified watercourses being more susceptible to flooding.

EXPECTED RESULTS

In the course of executing the aforementioned methodology for flood susceptibility analysis in Anambra State, it is anticipated that the study will yield valuable insights that contribute to the understanding of the complex relationship between flooding and disease occurrence. However, it is important to acknowledge that this analysis will not be without its challenges, and it is vital to consider the limitations that may affect the accuracy of the expected results.

The accuracy of the results is inherently tied to the quality of the data sources. Any inaccuracies or limitations in the DEM, rainfall data, or land use data may affect the precision of the flood susceptibility assessment. The accuracy of the flow accumulation threshold (500) and the assumption that flow accumulation indicates flood susceptibility may not fully capture the complexity of flood dynamics in the region. The analysis simplifies the multifaceted nature of flooding by focusing on elevation and flow patterns. Flooding can also be influenced by factors such as local hydrogeology, which are beyond the scope of this study. While the analysis will identify potential flood-prone areas, it is important to note that the direct connection between flooding and disease occurrence may be more complex and may require further investigation beyond the scope of this project.

The expected results of this analysis are anticipated to provide a comprehensive overview of areas in Anambra State that are more susceptible to flooding. The creation of flood susceptibility maps, based on flow accumulation and Euclidean distance from potential watercourses, will offer insights into potential flood-prone zones. The stream order classification will contribute to our understanding of the hierarchy of river networks.