

# **Risk Mapping Of Prone Areas of Gully Erosion in ASABA Metropolis, Delta State, Nigeria Using Geographic Information System (GIS) Technique**

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## **ABSTRACT**

*This project entails the Risk Mapping Of Prone Areas Of Gully Erosion Of part Asaba Metropolis(Ugbolu) The data acquisition which involves downloading of Google Earth Imagery, Acquiring data from field with the help of Differential Global Positioning System(DGPS) All the Data acquired were computed and adjusted digitally, in order to produce a Geodata Base plan of the project site.*

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## **I. INTRODUCTION**

Erosion has become one of the most dangerous forms of soil degradation leading to significant reduction of soil fertility, crop yields and even loss of lives and properties. The amount of soil erosion is mainly affected by vegetation cover, topographic features, climatic variables, and soil characteristics. Due to inappropriate land use, the human activities and large-scale developments alter the vegetation cover, impacting upon the soil erosion rate. Topographic features such as ground slope, slope length, and shape most affect rill and in Terrill erosion. The most important climatic variables are rainfall amount and precipitation intensity, which are called rainfall erosivity. Besides, temperature is another important climatic variable since it affects the vegetative materials which are used in mulching to control erosion. Soil erodibility is mainly affected by aggregate stability, texture, depth, organic matter, and stoniness.

Assessing the soil erosion rate is essential for the development of adequate erosion prevention measures for sustainable management of land and water resources. Geographic Information System (GIS) technologies are valuable tools in developing environmental models through their advance features of data storage, management, analysis, and display. The Remote Sensing (RS) technology has been used to provide the land use/cover information by using digital image processing techniques. There have been many studies on modeling soil erosion by utilizing RS and GIS technologies.

The capabilities of these technologies even increase when they are integrated with empirical erosion prediction models. While soil erosion models only calculate the amount of soil erosion based on the relationships between various erosion factors, RS and GIS integrated erosion prediction models do not only estimate soil loss but also provide the spatial distributions of the erosion. Especially, generating accurate erosion risk maps in GIS environment is very important to locate the areas with high erosion risks and to develop adequate erosion prevention techniques. Sazbo et al., 1998 conducted a study where RS and GIS technologies were successfully used for land degradation and erosion mapping. Another study by Bojie et al. (1995) also indicated that GIS analysis provide satisfactory results in developing erosion surveys and risk maps by using GIS data layers such as DEM, slope, aspect, and land use.

## **II. STATEMENT OF THE RESEARCH PROBLEM**

Globally, environmental challenges are increasing with accelerating speed beyond previous modeling outcomes and projections (GEF, 2012). Every country is therefore at the forefront of putting local-scale and place-based measures at combating these growing issues (Isiuwa, 2008; Bates, 2004).

In Nigeria, gully erosion in the form has produced long-term complications (Ofomata, 1982; Ofomata, 2002). These can be attributed to natural and anthropogenic (human) causes. Currently, over 60% of the already exposed land area of about 6,000 km<sup>2</sup> is highly vulnerable to erosion and damages estimated at over \$100 million annually mostly in southeastern and parts of south-south Nigeria (Ashekoya, 2009).

This state of gully affairs undermines economic growth and poses a threat to the developmental programs of the Federal Government of Nigeria including the currently pursued “Transformation Agenda” and “Vision 20-2020”. Adger et al. (2003).

Gully erosion in Asaba has become a serious environmental problem to the town and its neighboring villages. It has threatened and even destroyed many of the urban essential infrastructure and lives as well as retarding the social and economic growth and development of the town due to poor and unsustainable land use, coupled with inadequate drainage systems, protective vegetative cover are gradually removed from the land leading to high run-off, thereby creating deep gullies and devastating effect on settlements, major roads leading to adjacent cities and the lives of the inhabitants of Asaba

This research work therefore intends to predict the area prone to erosion on Asaba town using remote sensing and GIS techniques in the topographic mapping and analysis of the study area. Global Positioning System (GPS), base map, as well as direct field observation with a view to producing a topographic information system (a topographic data base) for spatial landscape modeling from satellite imagery

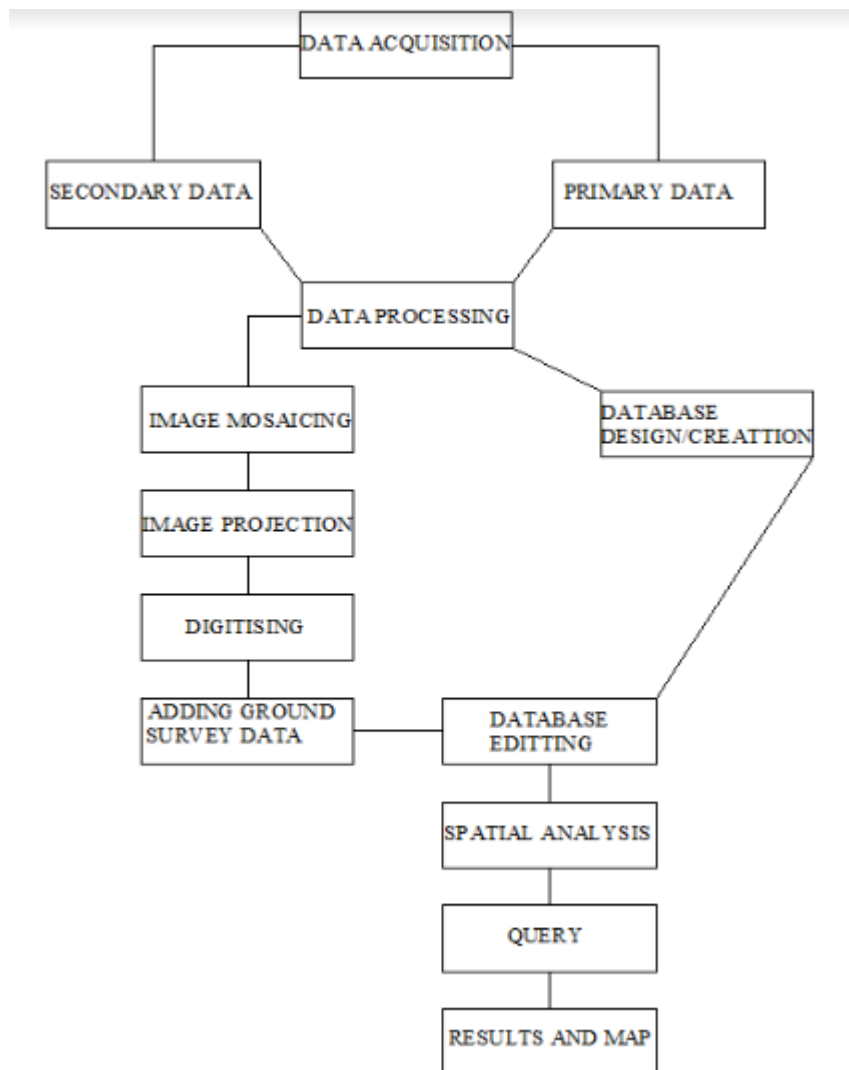
### III. STUDY AREA

The study area, Ugbolu (Asaba Metropolis) is located in the southern part of Delta state Nigeria. It is approximately one hundred and eighty four one kilometers (184.1Kms) away from Warri City, in Delta state Asaba is the capital city of Delta state It is located on a latitude of  $6^{\circ}21'$  North and  $7^{\circ}3'$  North of the equator and longitudes  $7^{\circ}00'$  East and  $6^{\circ}43'$



#### IV. METHODOLOGY

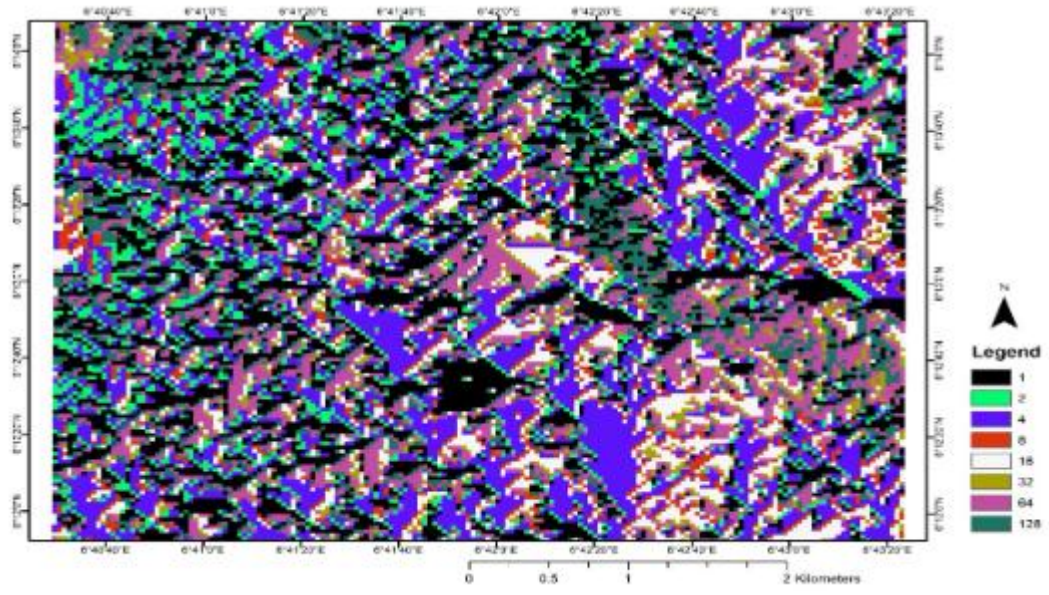
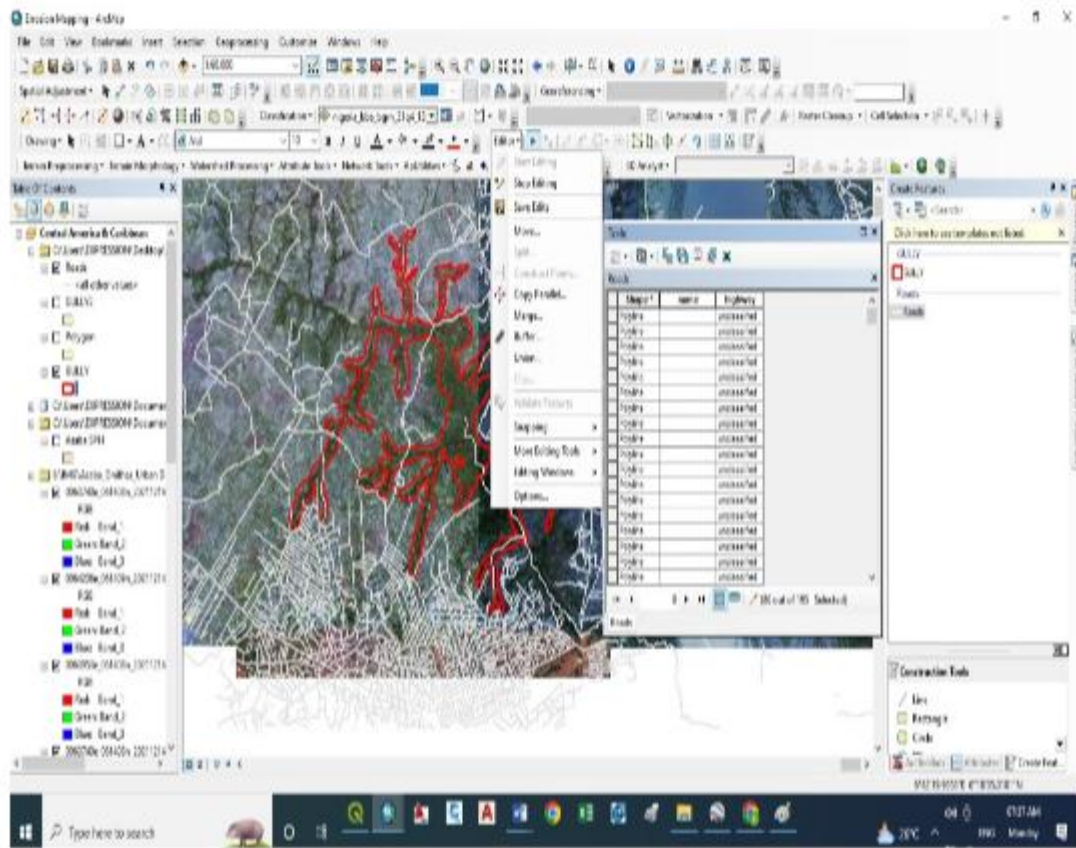
This chapter covers the research approach adopted for executing the project. It covers Data Acquisition, database creation, database editing, vectorization and other fundamental flow analysis. The project methodology is divided into stages as shown in the flow chart below



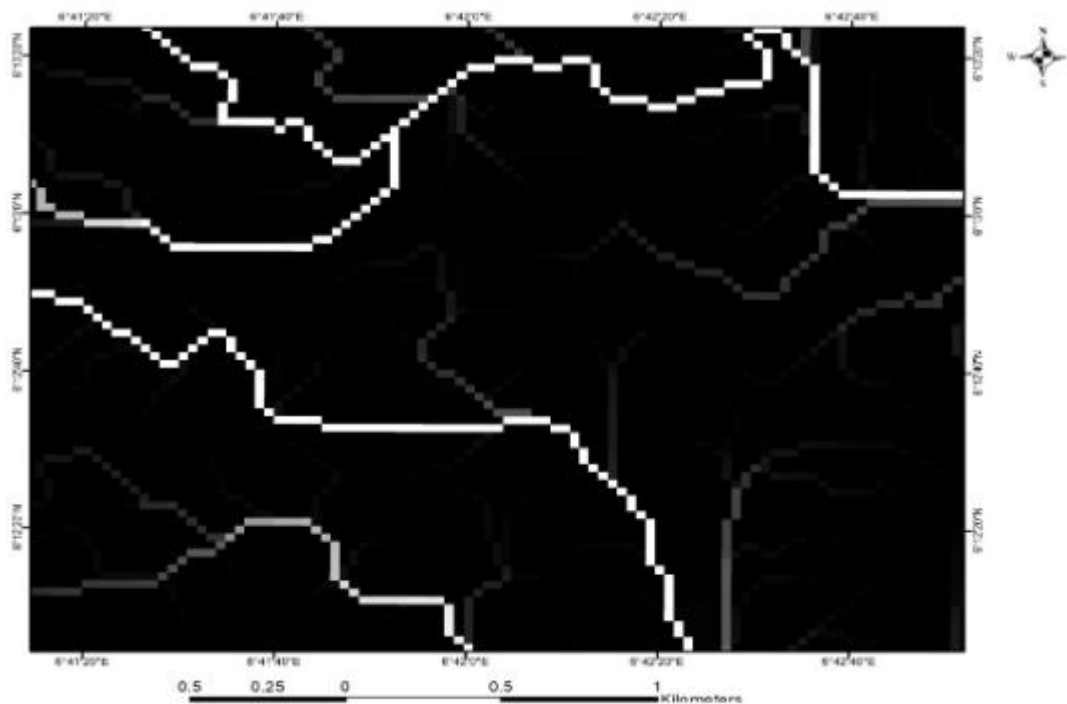
#### V. RESULT REPRESENTATION

This result is obtained from the analysis performed using ArcMap 10.5 Soft ware are presented. The results of the data base queries were presented in form of digital maps and graphic displays





Flow direction map of the study area



Flow Accumulation map of study area

## VI. Summary

The project covers Gully erosion mapping of Part of Asaba metropolis (Ugbolu) using GIS and remote sensing techniques. As such, relevant information such as buildings, roads and gully were extracted from the satellite image through vectorization using Arc GIS 10.7. SRTM data was downloaded using global mapper. The SRTM data were processed into flow direction map and flow accumulation map of the study area. Using Arc GIS 10.7, the flow direction map shows that water flows in south west direction of Part of Asaba metropolis(Ugbolu) The case studies presented here highlight the use of GIS-based erosion modeling to study the interactions and feedbacks between human activities and erosion processes different spatial and temporal scales. The study represents a unique application of erosion and landscape evolution modeling to investigation of relationship between geomorphology and evolution of prehistoric agricultural communities

## VII. Problems Encountered

In the course of execution of this project work, the following problems among were encountered.

1. Non availability of an existing base map of Asaba from which useful information would have been extracted for the execution of the project.
2. Inadequate hardware and software for the execution of the project exercises.
3. Inadequate power supply serves as disturbance to the entire work.

## VIII. Conclusion

The major problems of our city planners and administrators in developing countries particularly in Nigeria is lack of necessary required knowledge particularly (the GIS and remote sensing tools) to enhance their efficiency. Therefore in order to enhance functionality of the area and to reduce its social problem.

Remote sensing nowadays has become a modern tool for mapping of land use. Remote sensing system has the capability for repetitive coverage, which is required for change of detection studies. For ensuring planned development and monitoring the land utilization pattern, preparation of land use map is necessary.

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