

The effects of lithological formations of the monotonous landscape in the Niger delta region

Abstract

The Niger Delta is an area criss-crossed by network of Rivers and streams, its distributaries flood, erode transport and shape their channels, thereby determining the surrounding land-use and soil characteristics, as well as the lithological formations. The physical characteristics of the region is classified into five ecological zones of mangrove forest and coastal vegetation, freshwater swamp forest zone, lowland rainforest, derived savannah zone. Its geomorphologic factors are composed of sediment deposits washed from the inland and the flood plain of the region has river channels such as Orashi river, whereby the stream energy directed from side to side of the river channel, results in the widening of the valleys. Also the meteorological factors as a result of rainfall excesses are determined primarily by the amount, duration, intensity and time distribution of rainfall. In the Niger Delta the mean annual rainfall ranges between 3000mm to 4000mm that results into the wide distribution of swamps within the area, while the soil factor is being influenced by the climate, vegetation, lithology (rock type) and topography, thus the lithological formations along Orashi river are essentially alluvial and friable, do not resist any erosional tendencies, but rather tend to succumb and aggravate the situation.

Keywords: Orashi river, alluvial and friable, soil factor, topography

Volume 5 Issue 1 - 2022

Aloni Clinton

Department of Transportation Planning and Logistics, School of Environmental Sciences, Nigeria

Correspondence: Aloni Clinton, Department of Transportation Planning and Logistics, School of Environmental Sciences, Captain Elechi Amadi Polytechnic, Rumuola, Port Harcourt, Email aloni.clinto@portharcourtpoly.edu.ng

Received: November 18, 2022 | **Published:** December 01, 2022

Introduction

The Niger Delta is an area criss-crossed by network of rivers and streams, located at the central portion of the Nigerian coast along the Atlantic Ocean. The River Niger Delta extends from Benue River in the west to Bonny River in the east along the Nigerian coastline, and its inland limit is from the village of Aboh in Delta State of Nigeria, where the River Niger forks into Nun and Forcados rivers.¹ Egborge² and Dangana³ asserted that the Niger Delta like any other delta is built up by deposition of sediments due to decrease of flow velocity as the river and its tributaries enter a large and calmer water body. At the delta, the river and its distributaries flood, erode, transport and shape their channels, thereby determining the surrounding land-use and soil characteristics, as well as the lithological formations in the delta area which are essentially alluvial and friable, do not resist these erosional tendencies, resulting in a fairly and monotonous landscape.

Ecological zones of the Niger delta

FRN Report⁴ description of the physical characteristics of the Niger Delta, classified the region on to five zones, and these are;

- I. Mangrove forest and coastal vegetation. The mangrove swamps are largely muddy, saline water dominated and influenced by rain-water. Within these swamps are a number of fairly elevated islands that are dry throughout the year, thereby providing sites for settlement.¹
- II. Fresh water swamp forest zone which covers about half of the Delta Region. It is the region's major source of timber forest products, regarded as a southward extension of the lower Niger flood plain with greater silt and clay foundation.
- III. Lowland rain forest zone occupies the non-riverine or upland areas which flank the delta and the natural rainforest of the area has been largely cleared for agriculture.
- IV. Derived savannah zone is found in the northern parts of the Niger Delta region. The vegetation type in this zone appears a regrowth after the original rain forest has been cleared for agriculture.

- V. And the Montana zone is confined to the north eastern part of Cross River State in Nigeria being a high altitude area approximately 900 to 1500m above sea-level.

Geomorphologic factors

The Niger Delta region is composed of sediment deposits washed from the inland, made-up of extensive alluvial deposits that have attained great thickness, and the formation of this deltaic region results from continued deposition. Flood plain region of the Niger Delta has river channels such as Orashi River, whereby the stream energy directed from side to side of the river channel, results in the widening of the valleys, as the river cuts away first at one bank and then at the other, forming sweeping bends called meanders since the river flow pattern follows a winding turning course. The sideways movement occurs because the maximum velocity of the stream shifts towards the outside bends, causing erosion of the outer bank. At the same time, the reduced current at the inner part of the meander results in the deposition of coarse sediments, especially sand, being a common feature of a river's old-age stage when the land has been reduced to low relief by erosive processes. Orashi River being part of the Niger Delta has a dynamic environment and constantly merging with the waters of River Niger and its distributaries to flood, erode, transport and reshape its channels and the surrounding land area. Thus, the observation of Bell-Gam⁵ that the factors that influence the evolutionary characteristics of a river system are the altitude and orientation of a basin, shape and ground slope of the water bed, relief, rock type and soil mantle as well as the geologic structure, that make up the important elements which determines the hydrologic characteristics of a river system.

Meteorological factors

Rainfall excesses are determined primarily by the amount, duration, intensity and time distribution of rainfall in a particular basin. In the Niger Delta, mean annual rainfall ranges from over 4000mm on the coastal towns of Bonny and Brass in Rivers and Bayelsa states respectively, to 3000mm in the mid Delta area of Ahoada, Yenagoa and Warri in Rivers, Bayelsa and Delta States respectively. Rainfall

is slightly less than 2400mm in the northern parts of the Niger delta region in Imo and Abia States, while in the north-western parts of the region which includes Edo and Ondo states, annual rainfall ranges from 1500 mm to 2000mm.⁴ The impact of heavy rainfall and low evaporation in the Niger Delta region is accentuated by insufficient drainage capacity, caused by the generally flat topography, surface clay deposits and siltation of the river channels. This resulted into the wide distribution of swamps within the area, especially when considering the rainfall pattern in Nigeria that is highly seasonal in character, with a well-marked wet and dry seasons.³ The seasonal variation in rainfall is mainly attributed to the fluctuations of the boundary between two major air masses that influence the climate of West Africa. Kalu and Goodwill⁶ observed that the Niger Delta region, located in the humid area of Nigeria with roughly bimodal annual rain, have a mean number of 264 rainy days (a rainy day is one in which a minimum rainfall amount of 2.54mm or above may be recorded). This explains the obvious that the discharge of a stream increases in response to a period of heavy rainfall. This characteristic is very important, particularly in the tropics where rainfall intensity controls the probability and seriousness of local floods as well as affects soil erosion, landslides and sedimentation rates. These contribute to the evolutionary trend of a river system, since hydrological response of a drainage basin is defined by the production of runoff against a given rainfall that is characterized by basin morphometric properties, soil characteristics and land-use pattern.⁷

Soil factor

The factors of climate, vegetation, lithology (rock type) and topography have influence on the soil types of Nigeria. In the Niger Delta region, the soils are being described to be hydromorphic in nature, being seasonally or permanently water-logged and with poor drainage. Amase Nigeria Company⁸ confirmed that the soils of the Niger Delta consist of coarse sandy loam to silty clay loam to coarse sandy clay, classifying them into major units of moderately drained soil and imperfectly drained soil.⁹

Conclusion

Soils sediments helps to ascertain how particle size determines textural characteristic, relates to the dynamic conditions of detachability and entrainment. This therefore explains the erosional tendencies as well as deposition that exacerbates the changing river bank profile. The lithological formations along Orashi River are essentially alluvial

and friable, do not resist any erosional tendencies, but rather tend to succumb and aggravate the situation. Thus FAO (1998) assertion that high erodibility nature of tropical soils is traceable to the texture; which means that soil with more sand and silt fractions are generally erodible by over-land flow, which weakens the aggregates and therefore facilitates high erosion rate.

Acknowledgments

None.

Conflicts of interest

The author declares there is no conflict of interest.

References

1. Udo RK. *Geographical Regions of Nigeria*. Ibadan: Heinemann Educational Book Ltd. Nigeria. 1978.
2. Egborge CE. *Hydrological Consequences of Proposed Flood Control Works in the Niger Delta, Port Harcourt*. 1981.
3. Dangana LB. *Ecological Dynamics and Flood Control in the Niger Delta*. In Niger Delta Basin Authority Proceedings of a Seminar on Flood and Erosion Control in the Niger Delta, Port Harcourt. 1981.
4. Federal Republic of Nigeria (FRN). *Niger Delta Regional Development Master Plan, Port Harcourt: Niger Delta Development Commission (NDDC)*. 2006.
5. Bell-Gam WI. *Delta Coastal Erosion in Ecological Disasters in Nigeria: Soil Erosion*. Lagos: The Federal Ministry of Science and Technology, Lagos, Nigeria. 1988.
6. Kalu AU, Goodwill AO. *Climate Impact on Soil, in Erosion in Nigeria*. Ecological Disaster in Nigeria: Soil Erosion. Lagos: The Federal Ministry of Science and Technology, Nigeria. 1988.
7. Ajibade LT, Ifabiyi IP, Iroye KA, et al. Morphometric Analysis of Ogunpa and Ogbere Drainage Basins, Ibadan, Nigeria. *Ethiopian Journal of Environmental Studies and Management*. 2010;3(1):13–19.
8. Amase Nigeria Company. *Soil Investigation of Graduate Farms in Rivers State (Bukuma, Sagbama, Kpa, Okordia and Odhiolugboji) Port-Harcourt; Rivers State Ministry of Agriculture and Natural Resources*. Port Harcourt. 1988.
9. FAO. *Soil Map of the World*. World Soil Resources of the World Report, Rome. 1988. p. 107.