

Water, Earth, and Man: a Synthesis of Hydrology, Geomorphology, and Socio-Economic Geography;

Morphometric Parameters of the Calabar River Basin: Implication for Hydrologic Processes

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Abstract

The study examined the morphometric parameters of the Calabar River Basin with emphasis on its implication for hydrologic processes. Data for this study were obtained from topographic map which were subject to field confirmation. The result revealed that the basin area was 1 514km². There were 223 streams with a total stream length of 516.34km. The textural dissection was considered to be low as drainage density, stream frequency and drainage intensity values were 0.34km⁻¹, 0.13km⁻¹ and 0.05 respectively. The basin was found to be strongly elongated with circularity ratio of 0.34 and elongation ratio of 0.64. The average bifurcation ratio was 2.83. The very low value of drainage intensity implies that drainage density and stream frequency have very little effect on the extent to which the surface has been lowered by agents of denudation. These low values of drainage density, stream frequency and drainage intensity also imply that surface runoff is not quickly removed from the basin, making it susceptible to flooding, gully erosion and landslides, particularly in the lower part of the basin. It is therefore recommended that human activities that could impact negatively on stream network in the basin should be discouraged.

Keywords: Morphometric, Parameters, Hydrologic, Processes

1. Introduction

Studies on drainage basin morphometry have been carried out in many parts of the world. In Nigeria, such works include those of Okechukwu (1974), Ebisemiju (1976), Faminra and Ojo (1980), Anyadike and Phil-Eze (1989), etc. The basins in their areas of studies have been classified as the case may be and drainage basin morphometry related to the processes that are prevalent in such areas. Again, drainage basin morphometric parameters can be used to describe and compare basins of different sizes. Such parameters include stream order, stream length, stream number, and basin area. Others are basin shape factor (eg. circularity ratio, elongation ratio, form factor and compaction ratio), basin perimeter, bifurcation ratios, drainage density, stream frequency and drainage intensity.

But the story is different as far as the Calabar River Basin is concerned. No segment of the basin is gauged and only piecemeal information on the basin is available as no research has been carried in this direction. Yet the basin is characterized by hydrologic and geomorphic problems like flooding, erosion, mass movement, etc.

It should be noted here that some segments of the Calabar River Basin floods perennially. Eze and Abua (2003) have noted that perennial flooding is a common menace of most of the southern part of Nigeria. Such flooding events affect movement of commuters along some segment of the basin. But the situation is getting worse year after year.

In a reconnaissance study embarked upon by the researchers in December 2007 to the area, residents within Akai Effiwat, Ekenkpon, Uwet, Njakachang and those of Oduyama villages within the Calabar River Basin noted that the level of flooding within the areas have been on the increase over the last few years. It was noted that some of the areas that were not usually flooded has been experiencing it in recent years.

There are relationships between drainage basin morphometric parameters and flood potential. For instance, it has been discovered that the higher the drainage density, the faster the runoff and the more significant the degree of channel abrasion is likely to be for a given quantity of rainfall. Also, drainage density provides a link between the form attributes (morphometry) of the basin and its erosional process (Bates, 1981). Such would result to greater probability of flash floods. The measurement of drainage density again, provides hydrologists and geomorphologists with a useful numerical measure of landscape dissection and runoff potential (Pidwirny, 2006). In homogeneous bedrock, bifurcation ratio influences the landscape morphometry and plays an important control

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