Recent developments in geomorphometry and numerical parameterization of the earth’s surface provide bases for estimating basic hydro-geomorphological indices. Such indices are needed in the measurement and classification of drainage basins properties and their responses to input. This is of importance while considering the need to address issues related to integrated water and risk management as well as drainage basin system responses prediction and modeling, most especially in ubiquitous Ungauged basin. Hence, hydro-geomorphological measurement is becoming increasingly common in hydrological studies in prediction of ungauged basins towards policy-relevant science approach, in a technical-scientific way.

In this study a systematic drainage basin approach based on terrain analysis was used to quantitatively estimate the response of the hydrological system within the poorly gauged Yewa basin. The technique involves the adoption of a systematic approach to studying the relationships between forms and processes within hydrological and geomorphological systems in the Yewa drainage basin. The hydro-geomorphological analysis forms the basis for modelling and simulation of Yewa basin system response to input in the generation of an Instantaneous Geomorphological Unit Hydrograph (IGUH) for Yewa sub-basins, using the D-8 drainage model and identification of major basins and their sub-basins with their slopes in a descending order in accordance to the Bocquillon classification. Prediction of runoff amount, peak and volume from rainfall (input) was also carried out using the estimates from the generated hydrographs, in order to resolve one of the 21st century challenges, in poorly gauged and ungauged basin.