In shaping the present volume APPLICATION OF MORPHOMETRY IN GEOMORPHIC ANALYSIS OF THE BRAHMANI BASIN IN BIHAR AND WEST BENGAL, efforts have been made to apply morphometric techniques in the geomorphic analysis of the Brahmani Basin and deduce therefrom the suitability and significance of the techniques as well as the geomorphic evolution of the Basin as a whole.

Broadly speaking, geomorphology is the study of landforms, their materials which make them and the processes that shape them. The discussion concentrates, therefore, on these three main aspects - materials, processes and morphometric analysis endeavouring a complete geomorphic study of the Brahmani Basin. One chapter each is devoted to materials and processes. The morphometric analysis spreads in seven chapters. Thus, the work is divided altogether into fifteen chapters. Each chapter includes various aspects of discussion to achieve the goal how the Brahmanian landscape has been shaped out.

Why, where and how the plan of study has been set up, is included in the Chapter 1. A critical analysis of the previous literature related to the area has also been made in this chapter.

The study of the materials and their structural characteristics has been necessitated in the context of the geomorphic evolution of the Brahmani Basin, because these are the fundamental elements which play important role in the origin and development
of the landforms. Chapter 2, therefore, deals with the materials of the study area with reference to age, structural characteristics of the constituent rocks, igneous activity, folds, faults, joints and soil stratigraphy.

The central theme of this discussion is to understand temporal and spatial variations in geomorphic processes and the resulting pattern of forms in the Basin. It is emphasised because landforms embody the effects of both contemporary and past geomorphic processes. Geomorphic processes or events in the study area have been spatially contiguous, but have varied with regard to the nature, intensity, frequency and magnitude of occurrence over different lengths of time. Chapter 3, therefore, deals with both the evolutionary and external gradational processes in greater detail.

Most of the areas in humid tropical climate evolve under the impact of running water. Therefore, in Chapter 4, patterns and evolution of the drainage have been examined, which have ultimately helped in the understanding of the evolution of the Brahmani Basin.

A broad outline of the forms indicating their evolutions was essential for the better understanding of the evolution of all the features. Chapter 5 has been devoted for this purpose.
Depending on the basic form elements of fluvial landscape system, channel requires measurement of linear aspects of drainage network, areal aspects of drainage basin and relief and slope aspects of dimensions. The first two methods of measurements are in a single plane while rest categories treat vertical inequalities of the drainage basin form. In Chapter 6, therefore, all the methods of measurement of these vital properties of channel network have been examined. It is not possible, rather not desirable too, to comprehend all the attributes for analysing geomorphology of the Brahmani Basin. So, in this chapter, after going through merits and demerits of almost all the attributes, the author has selected some of the important techniques which have applicability to the study area. Further the author has used some statistical methods to make the analysis more clear as well as to establish correlation between them.

The present humid climate which prevails in the Brahmani plays an important role in the character of the development of the rivers and its valleys. Chapters 7 & 8, therefore, examine various aspects of drainage which have ultimately helped in the understanding of the evolution of the Basin. An analysis of the divides of the Basin brings out salient features in relation to structure, drainage organisation and the stage of denudational cycle. The bivariate analysis of drainage network discover certain growth principles. The shape analysis of the Basin has provided
some clues regarding their origin, evolution and ecology. The distribution of source-heads and confluences expresses the phases of drainage evolution and clearly depicts the nature of land and influence of structure. Similarly the analysis of drainage texture gives the idea about the variation of relief, rock structure, vegetation and stages of the erosion cycle. The stream-line surfaces indicate the amount of denudation still to be achieved.

Since relief measures are indicative of the potential energy of a drainage system, by virtue of elevation above a given datum a detailed discussion in Chapter 9 has been made by using several methods of relief representation, such as relative relief, absolute relief, average relief, dissection index, ruggedness index, roughness index, area-height analysis, altimetric analysis and their cross correlations.

The study of slope in the Brahmani Basin has been necessitated both owing to its theoretical and practical significance. We know that a particular element of slope is the product of a certain process, e.g., in the area of fluvial processes there is high percentage of convexity over the slopes or in the arid region the concavity dominates over other elements of slope and so on. Thus if we can ascertain the amount of different elements of slope in a particular region, we can deduce therefrom the evolution of landscape, even during the geological past if the slope
elements have no accordance with the present working processes. Therefore, the slope study of the Brahmani Basin in Chapter 10 has helped in the understanding of the landscape evolution as well as denudational chronology.

It is a fact that mere quantitative studies of geomorphology do not establish the subject in sound scientific footing both for analysis of the three major core aspects - structure, process and stage and their impact on further behaviours on the landscape. Therefore, in Chapter 11, only the bivariate relationships among the different morphometric variables have been estimated to establish the nature of their relationships.

To get a clear picture of a drainage network of the Brahmani catchment, the sample study is essential. Chapter 12, therefore, deals with the selection of ten (10) drainage basins of equal order (4th order) from each side of the major streams Brahmani. Their drainage networks are examined in detail. In determining completely the composition of stream system, various morphometric parameters have been worked out. In a complete drainage basin one can see even the stages of landscape development. Simple and multiple relationships among the morphometric variables of the drainage basins have been discussed, which play a significant role in the watershed management.

The Brahmani Basin itself is a geomorphic region in the
Chotanagpur plateau and Bengal plain. But there are variations in materials, processes and forms. The western plateau of the area comprises of granite and gneiss, the south-eastern part is a new alluvial tract and hill-top and plateau fringe area has capping of hard basaltic trap. Both endogenetic and exogenetic processes have evolved a variety of forms ranging from a near-flat alluvial zone to the high steep hill-sides. The morphometric variables like relative relief, dissection index, average slope, drainage texture, hydrographic network and many other aspects of morphometry clearly depict the spatial variations within the Basin. All these variations have been depicted in Chapter 13, by dividing the study area into geomorphic regions.

The main object of this volume is to make geomorphic analysis of features of the Brahmani Basin and deduce therefrom the landscape evolution of the area. Although tracing the geomorphic evolution of an area is beset with complexities, this has been attempted systematically. Chapter 14, tries to discover how the whole region came to appear in this form. It is looking for, of course, a short of life-history of landscape, a model sequence of events, or an alternative theory that would account for the most of the variety, we observed in the Basin. Chapter 14 also aims to discuss and examine the significance of climato-genetic and tectono-genetic geomorphology in the geomorphic interpretation of the Brahmani Basin.
Finally, in Chapter 15 attempts have been made to sum up the study and to present summary and review of the main findings.

Illustration have been selected for their direct and clear impact. Many new line drawings and graphs have also been structured to this end. Tables have been reduced to the fewest possible number. Photographs have been carefully selected to illustrate precisely the subject under discussion. At the close of each chapter references have been mentioned and a classified bibliography has been placed at the end of the discussion. Glossary has been included for clarification of terms used in the text.

The study is new for several reasons and, in its humble way, is a contribution to the field of geomorphology. It is based on a detailed analysis of morphometric techniques and intensive field study. To what extent has the present work succeeded is a subject to be judged by the readers.

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23/2/88
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