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Preface

Badlands are multivariate, self-enhancing systems of erosive processes which are characterized by intensely dissected topography with iterative patterns of rill-gully-channel networks having deteriorated soil properties, reduced soil fertility and sparse vegetation. They often develop on unconsolidated or poorly consolidated sedimentary deposits and frequently occur in arid and semi-arid regions, and soils characterized by slow formation and no nutrient cycling. Badland erosion is a major sediment source for river systems in dry lands. High erosion rates thus not only account for a loss of soil productivity but ultimately can also lead to reservoir siltation. Badlands formation is a challenging problem globally and such erosive systems may initiate due to varieties of factors related to natural or anthropogenic causes.

In India most of the work was done in the Chambal sector of the Yamuna-Chambal ravine zone and there also a holistic approach to encountering badlands generation and process was missing. There is no standard methodology and guideline procedure to revive the eco-system of badlands. The present work focuses on a holistic approach to developing understanding regarding the badlands process in and around Chitrakoot town along the bank of the Mandakini River. The study represents the morphology and the intrinsically related characteristic details of the badlands systems in order to the investigation of causative factors and conditions thereof and suggestive reclamation plans.

This thesis, structured in ten chapters, has brought together geological, geomorphological, geo-chemical, geo-technical, hydro-meteorological and ecological aspects of badlands formation. The first chapter of the thesis describes the

introduction of badlands, possible causative factors and the objective of the study. The second chapter discussed a detailed literature review and gathering state of the art understanding regarding badlands formation, badlands morphology and various processes of formations. The third chapter describes the location, climatological conditions, geomorphology and geology of the study area. The fourth chapter deals with the materials and methods that were adopted for the various studies. The fifth chapter contains the macro-scale mapping by morphometric analysis, followed by the indexing of badlands initiating morphometric parameters. The sixth chapter deals with the tectonic influence over the region with the help of surficial tectonic features and morpho-tectonic parameters. The seventh chapter deals with the interdependence and mutual impact of the physic-chemical properties of the soils and the badland process. The eighth chapter focuses on multifractal analysis of the badland formations. Based on these investigations and gathered knowledge on the badlands in and around Chitrakoot town, various reclamation techniques were discussed in the ninth chapter. The suggested reclamation techniques are self-sustainable and based on locally available materials containing vegetative and engineering approaches. The last chapter deals with the conclusions, summary and the future prospects. This work is an important contribution to the study of the badlands. It may be helpful in the the monitoring, assessment and reclamation of the existing and emerging badlands for the benefit and growth of the society.