

Advances in Science, Technology & Innovation
IEREK Interdisciplinary Series for Sustainable Development

Pravat Kumar Shit · Hamid Reza Pourghasemi
Gouri Sankar Bhunia *Editors*

Gully Erosion Studies from India and Surrounding Regions

EXTRAS ONLINE



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Gully Erosion Studies from India and Surrounding Regions

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Dedicated to beloved teachers and parents

Foreword



I am happy to learn that Springer-Nature Publishing Company is bringing out a book on “Gully Erosion Studies from India and Surrounding Regions” under the Advances in Science, Technology & Innovation (ASTI) series on Sustainable Development. The book is jointly edited by Pravat Kumar Shit, Hamid Reza Pourghasemi, and Gouri Sankar Bhunia who are eminent scholars and researchers in the field of geomorphology and advanced geospatial technology.

Gully erosion is the erosion process whereby runoff water accumulates and sediment production is varied in various temporal and spatial scales and under the different climatic conditions and land-use patterns. Soil is the most fundamental and basic resource that provides food, fodder, fuel, and fiber. It underpins food security and environmental quality. The essentiality of soil to human well-being is often not realized until the production of food drops is jeopardized when the soil is severely eroded or degraded to the level that it loses its inherent resilience.

India and its surrounding regions are experiencing major problems in land degradation and mismanagement in land-use practices. By contrast, mismanagement and also the sustainability of the current and future soil and land resource allocation are other concerns. Thus, it is important to use the newest technologies and tools to improve and properly develop sustainable management. In this context, the book has been very effectively organized into thematic sections, covering the fundamental concepts of the gully classification system, erosion processes, and prediction, modeling, and sustainable management strategies.

It is a cohesive effort of a number of authors, researchers, and experts in the field of geomorphology across the country and other parts of the world. The editors have done an exemplary job in collecting, compiling, and editing the papers in a book form. The quality of

this interdisciplinary research can be realized by readers by going through chapters in this enriched volume. This book will be very much beneficial for geomorphologists, hydrologists, soil scientists, students, scientists, ecologists, and policymakers.

I extend my warm greetings to all those associated with the publication and congratulate Springer-Nature Publishing Company for launching this book.

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Savindra Singh

Preface

Gully erosion is the removal of soil along constricted channels via the accretion of surface runoff, which tends to yield more sediment loss than other types of soil erosion, such as overland drift or rilling. Gully erosion is physiographically prevalent and is recognized by numerous terms in various regions. Gullies cause widespread destruction to infrastructures and susceptible cultivated lands and adulterate water by confiscation and aggradation of soil elements and chemicals from manure. Gullies are everlasting erosional practices that grow in several areas of the biosphere, predominantly in arid and semiarid zones. Unscientific land-use practices and mismanagement of land use and strategies may accelerate gully development by head cutting, sidewall breakdown, piercing, floor corrosion, and other procedures, which bring about extensive land deprivation and probable mutilation to human erections and activities.

Gully erosion has worldwide effects on agricultural, financial, and sociopolitical circumstances; nevertheless, statistics concerning the amount of these influences have been principally unpredictable. This book emphasizes the reciprocal interactions of gully deprivation, management, and remediation. It highlights the instantaneous and long-lasting effects of gully degradation in association with the geospatial technology in arid and semiarid environments.

The collection of thirty-one chapters draws on the research of an international group of scholars and practitioners who work in college, universities, government sectors, private consultancies, and research centers. Their expertise is in the field of applied geomorphology, hydrology, sedimentology, ecology, and engineering. Their methods include intensive field investigations, laboratory experimentation, geospatial technology, and modeling of gully susceptibility mapping, monitoring, and management.

This book addresses the core subjects associated with morphology and development of rill-gully, restoration strategies of gully and ravine land, gully collapsing in lateritic belt, risk estimation of rill and gully erosion by random forest model, geomorphic threshold and SCS-CN-based runoff-sediment yield modeling, Bayesian weight of evidence, RUSLE, and SDR model, hydraulic flume experiment, SWAT model, plant roots—an experimental insight, MARS model, SVM machine learning algorithm, etc. Research results are presented in this book that forms the scientific basis for the extensive evaluation of gully erosion, control and greening for livelihood, and environmental sustainability. The book covers a wide range of vital topics in the areas of gully erosion and water erosion at lateritic uplands of India and its surrounding regions. Additionally, the book offers GIS-based advanced cartographic techniques for students to recognize both simple and classy concepts of applied geomorphology. It is an ardent challenge to efficiently guide the aspirants who are involved in research and development in applied geomorphology. Chapter-end references, which are recent and resourceful, shed light on topics mentioned in this book.

We thank all the authors who have meticulously completed their chapters at short notice and contributed in building this edifying and beneficial publication. We believe this book will be of great value to geographers, geologists, agricultural engineers, hydrologists, soil scientists, ecologists, research scholars, environmentalists, and policymakers.

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Disclaimer

The authors of individual chapters are solely responsible for ideas, views, data, figures, and geographical boundaries presented in the respective chapters of this book, and these have not been endorsed, in any form, by the publisher, the editor, and the authors of forewords, preambles, or other chapters.

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