

The background of the cover is an aerial photograph of a lush green landscape with rolling hills, a river, and a small town. Overlaid on this image are various digital and technical graphics, including a large circular grid pattern, several glowing blue hexagons, and circular icons containing data charts and maps. The overall color palette is dominated by shades of teal and blue, giving it a high-tech, futuristic feel.

GEOSPATIAL TECHNOLOGY FOR NATURAL RESOURCE MANAGEMENT

Edited By
**Shruti Kanga, Gowhar Meraj,
Suraj Kumar Singh, Majid Farooq,
and M. S. Nathawat**

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Geospatial Technology for Natural Resource Management

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Shruti Kanga
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Preface

In today's rapidly evolving world, where discussions around the health of our planet have taken center stage, the significance of intertwining technological advancements with sustainability efforts cannot be understated. It is against this backdrop that *Geospatial Technology for Natural Resource Management* emerges, a collaborative effort by a distinguished panel of professionals who have dedicated significant parts of their careers to the fields of geography, technology, and environmental studies. This pivotal work unravels the intricate world of geo-informatics—a field that has been gaining momentum due to its potential to change the way we view and interact with our environment. The core tenet of the book is simple yet profound: for any sustainable development efforts to be truly effective, a comprehensive understanding of the Earth's diverse resources is indispensable. Beyond merely cataloging these resources, the book argues for a dynamic approach. This involves a cyclical evaluation, where resources are not only identified but are also assessed in terms of their current states, potential risks, and appropriate management interventions. The optimism around such a robust assessment process is largely fueled by technological innovations that have emerged over recent decades. Remote sensing (RS), for instance, is heralded in the book as a game changer. The sheer breadth and depth of data that RS can collect—spanning different geographical terrains and spectral ranges—are invaluable. It offers transformative insights, whether it is in predicting agricultural yields or devising strategies for disaster risk reduction. India, a country with an expansive and diverse geographical landscape, provides compelling case studies. The book highlights how the nation has leveraged RS, among other technologies, to gather and analyze data across multiple dimensions, becoming a benchmark in the global arena. But RS is not the only hero in this story. The global positioning system (GPS), often relegated to being a tool for navigation, emerges in a new light. The book enlightens readers on the broader capabilities of GPS, especially its role in continuously monitoring and documenting subtle shifts and patterns in the Earth's environment. When this vast pool of

data is synthesized using geographic information systems (GIS)—a powerful tool that goes beyond presenting data to offering detailed spatial analyses—the possibilities are limitless. In drawing attention to these technological wonders, the editorial team does more than just present facts. They paint a vision of the future, a world where technology and environmental consciousness coalesce to address some of our most pressing challenges, from environmental degradation to unchecked urban expansion. At its core, *Geospatial Technology for Natural Resource Management* stands as a clarion call. It invites its readership, spanning academics, policymakers, practitioners, and even curious individuals, to immerse themselves in the vast potential of geo-informatics. It is not just an academic pursuit; it is a journey towards envisioning and working towards a more sustainable, harmonious world. The volume, in its essence, epitomizes the marriage of technology and environmental studies, making it an essential read for anyone invested in our planet's future.

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Editors

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xxii ACKNOWLEDGEMENTS

In essence, *Geospatial Technology for Natural Resource Management* is not just the product of its editors and contributors; it is a collective masterpiece shaped by every hand that touched it, every mind that engaged with it, and every heart that believed in it. For this symphony of collaboration, we remain profoundly grateful.

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Editors

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Introduction

In today's world, it is more important than ever to understand the relationship between the environment and technology. The opening chapters of *Geospatial Technology for Natural Resource Management* showcase the depth of this understanding. These chapters set the stage for the book's broader discussions about the marriage of technology and nature, the value of data in decision-making, and the urgent need for sustainable practices. Urban growth is not just about the rise of cities; it is about balancing growth with available resources. As cities expand, they face challenges such as sustaining the environment, using land wisely, finding energy sources, and ensuring water supply. This section of the book explores these challenges and emphasizes the importance of a balanced, sustainable approach to urban development. Water systems, from lakes and rivers to underground reserves, tell a story about our planet's health and changes. By examining these systems, we learn more about broader topics like climate change, changing patterns of snow, and the potential of groundwater. The chapters dedicated to this topic highlight the complexity of these water systems and emphasize their value and importance to the environment. As we continue in the 21st century, it becomes even more crucial to study our surroundings and understand how they are changing. Many of these changes come from human actions and they can influence both the environment and society. This collection of studies uses tools like geospatial techniques and surveys to better understand these changes. The aim is to offer insights and inspire everyone, from casual readers to policymakers, to work towards preserving and sustaining our world. To further guide the reader, individual prefaces will follow for each chapter. These provide a closer look into the specific topics and research methods of each contribution, offering a clear roadmap for the reader's journey through the book.

Chapter 1 sets the tone with a comprehensive study on groundwater in the Bhandara district of Central India, emphasizing its importance for agriculture and drinking. By correlating groundwater conditions with rainfall data spanning over four decades, the study paints a vivid picture of how the

environment has shifted and what it means for the quality of groundwater. A highlight is the meticulous hydro-chemical characterization and the geospatial analysis techniques employed. In **Chapter 2**, the focus pivots to the dynamic realm of disaster response and recovery. The author dives into the world of technology, elucidating how innovations such as GIS, UAVs, and data analytics play crucial roles in enhancing disaster management capabilities. The chapter underscores the power of technology to not only respond to disasters but to predict and mitigate their impacts. **Chapter 3** ties in the global agenda of Sustainable Development Goals (SDGs) with the pressing concerns of natural and technological hazards. Khan's exploration into this synthesis is both timely and insightful. By identifying the intersections between specific SDGs and disaster risk reduction (DRR) strategies, the chapter offers a comprehensive roadmap for harmonizing global development objectives with hazard management. **Chapter 4** takes us on a journey to the Girna River Basin in Maharashtra, combining hydrological parameters with morphometric analysis. By employing remote sensing and GIS techniques, the study effectively characterizes the river basin's geomorphological features, shedding light on potential flood risks and the intricate dance between topography and water flow.

In **Chapter 5**, authors, present a vital study on the geospatial analysis of the effects of waste disposal on groundwater quality within a semi-rural community in Nigeria. As rapid urbanization continues to exert pressure on local ecosystems, understanding the relationship between waste disposal and water quality is crucial. Through laboratory investigations and surveys, the researchers provide quantitative data revealing a correlation between proximity to dumpsites and groundwater contamination. This chapter is a poignant reminder of the immediate threats posed to potable water sources by poor waste management practices and provides valuable insights for policy makers, environmentalists, and the general public. **Chapter 6** explores the impact of global construction material demand on natural resources, focusing on sustainable alternatives to sand in concrete. It evaluates the use of marble powder, glass fines, and fly ash as partial substitutes for natural sand. Results show that certain waste material combinations improve concrete properties and reduce environmental impact, highlighting the potential for sustainable construction practices. **Chapter 7** explores the dynamics of land use/land cover (LULC) in Maharashtra's Kolhapur District. The authors employ sophisticated remote sensing techniques and GIS methodologies to trace the watershed's changes over time. By offering a clear picture of the dominant land uses, such as agriculture and forest cover, the study provides critical data for local planners,

environmentalists, and policymakers. The findings have vast implications for sustainable land management in the region.

Chapter 8 examines the use of village maps as tools for regional development planning. It focuses on generating geospatial data for Dungarpur Reelka, India, addressing deficiencies in education, health, and infrastructure. High-resolution images and spatial analysis were used to create thematic layers. The resulting maps could serve as models for other communities. **Chapter 9** pivots our attention to the geospatial analysis of land use and its dynamics. The authors present a comprehensive analysis of the land use changes in Varanasi, using sophisticated tools like GIS and landscape metrics. Their findings underscore the challenges faced by policymakers and the ripple effects of urban expansion on peri-urban areas. **Chapter 10** investigates the factors influencing online shopping behavior in North Bengal. It analyzes survey data from 700 respondents, identifying comfort, product variety, and cost savings as key drivers. The study highlights the importance of website quality, security, and customer support in enhancing consumer satisfaction and regional development. **Chapter 11** explores the relationship between protected areas (PAs) and tourism in India. It reviews the growth and management of PAs, emphasizing their role in biodiversity conservation and sustainable development. The study highlights the need for well-managed, connected, and financed PAs to address climate change and achieve conservation goals.

Chapter 12 immerses readers into the mesmerizing world of diatoms from the Renuka Lake, situated in the Indian Himalaya. By examining sediment cores from the lake, the authors intricately weave together the story of how these microscopic algae have responded to global warming and other climatic alterations over nearly two centuries. The chapter highlights the vulnerability of such freshwater systems to global phenomena, giving readers a nuanced understanding of regional responses to global challenges. Moving from the tranquil waters of a lake to the expansive territories of the *Beas Basin* in **Chapter 13**, the narrative shifts focus to the significance of snow cover in shaping hydrological dynamics. Here, the innovative use of remote sensing to monitor snow cover is brought to the forefront. The authors elucidate the intricacies of snow cover health and its ties to atmospheric river flow, seasonal variability, and overall watershed health. This chapter emphasizes the profound influence of snowmelt on riverine systems and the communities that depend on them. **Chapter 14** delves deep beneath the surface to explore the hidden world of groundwater in the Godavari Sub-Basin. Groundwater, the silent provider for countless communities, is facing increasing stress due to overexploitation. This chapter employs sophisticated GIS techniques and an analytical hierarchy process

to map and evaluate groundwater potential zones. This critical information is indispensable for sustainable management, ensuring that this life-sustaining resource is available for generations to come.

Chapter 15 presents an exhaustive study of the LULC changes in Dhanbad district of Jharkhand, India, over a period of five decades. The district, renowned for its Jharia Coalfield, has witnessed drastic LULC alterations chiefly due to coal mining activities, leading to changes not only in the physical landscape but also impacting air and water quality. Leveraging advanced geospatial techniques and satellite imagery, the authors meticulously chart the evolution of this district, shedding light on the anthropogenic forces at play. Moving to the state of Uttar Pradesh in **Chapter 16**, we find a comprehensive assessment of land susceptibility to degradation in Siddharthnagar district. Recognizing the inherent relationship between the quality of land and agricultural productivity, this chapter probes the reasons and degrees of this susceptibility based on various indicators. The findings of this chapter are crucial for policymakers as they offer insights into the areas requiring immediate attention, ensuring the sustainability and preservation of the region's land resources. **Chapter 17** shifts focus to the urban milieu, emphasizing the critical role played by small and medium cities in the grand tapestry of urbanization. Concentrating on Mirzapur city in Uttar Pradesh, the research paints a vivid picture of the city's urban restructuring and development patterns over recent decades. By exploring facets like urban housing, transport, civic infrastructure, and more, this chapter offers a holistic view of the challenges and opportunities presented by urban development in medium-sized Indian cities. Finally, **Chapter 18** delves into cultural tourism in Kushinagar, Uttar Pradesh, India, conducting a SWOT analysis to assess its strengths, weaknesses, opportunities, and threats. It reveals tourism trends showing growth until 2018–19, a decline due to the COVID-19 pandemic, and a recovery phase in 2021–22. The chapter offers recommendations like developing theme-based tourism circuits and improving infrastructure to enhance Kushinagar's tourism sector. These strategies aim to enrich visitors' cultural experiences, promote intercultural dialogue, and boost the local economy.



Chapter 10

Human Resource Influences on Online Shopping Behavior

Factors, Preferences, and Satisfaction Among Consumers in North Bengal, India

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Summary

Technology and media have propelled global online shopping. Through customer service strategies, marketing efforts, and the cultivation of brand loyalty, human resource significantly influences online shopping behavior. Comfort, product variety, cost savings, and information accessibility are driving online purchasing. Age, income, and Internet use impact online shopping. Website, product, and security quality are key to online shopping, impacting consumer satisfaction. This study used questionnaires to collect data from 700 respondents in Siliguri, Jalpaiguri, Alipurduar, Koch Bihar, Raiganj, Balurghat, and Malda. Between April and July 2023, data was collected through survey on respondents' demographics, Internet usage, and purchasing preferences. Analyses included descriptive statistics, chi-square testing, factor analysis, and importance-performance. Demographic data showed that most North Bengal Internet buyers were 26–35 years old, had greater monthly earnings, and spent more time online daily. Consumers favored electronics, apparel, and cosmetics. Based on factor analysis, convenience, online shopping obstacles, product comparison and variety, and pricing awareness influence online shopping. According to the Importance-Performance Analysis, online shopping satisfied customers in terms of account management, user-friendly navigation and return and refund policies. However, customer support and security needed improvement. Regional development and customer satisfaction will depend on addressing performance gaps and ensuring a secure and seamless online shopping experience.

References



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References



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