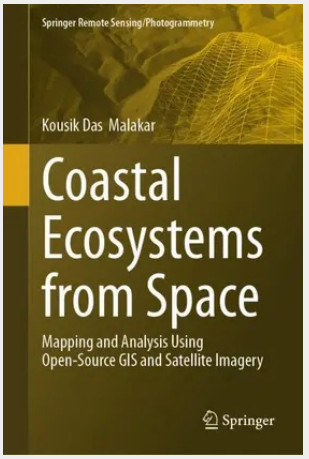
Malakar

Coastal Ecosystems from Space

Mapping and Analysis Using Open-Source GIS and Satellite Imagery



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This book presents a comprehensive and accessible account of coastal ecosystem monitoring and management using open-source remote sensing data and Geographic Information Systems (GIS), with a strong focus on community engagement and sustainability. It is organised into three interconnected parts that move from foundational concepts to applied analysis and finally to emerging technologies, providing a clear and logical progression from basic understanding to practical implementation and further innovation.

The first part introduces the concept and technical foundations of coastal remote sensing and open-source GIS, focusing on the spectral characteristics of key coastal ecosystem components and outlining preprocessing techniques to improve satellite data quality. It also introduces open-access geospatial databases and explains how diverse datasets can be integrated using open GIS platforms. The second part moves into practical applications, focusing on coastal mapping and analytical approaches using open remote sensing data and GIS tools such as QGIS, SAGA GIS, Google Earth Engine, and GRASS GIS. It presents case studies on land use change and habitat dynamics, land surface temperature trends, spatio-temporal spectral analysis of coastal vegetation, canopy water and nitrogen, soil-based contents, coastal agro-environmental assessment, coastal urban landscape dynamics, shoreline change detection and dynamics, and mangrove dynamics and management. This section also places clear emphasis on participatory GIS approaches, drawing attention to the contributions of citizen science, indigenous knowledge, and collaborative GIS in improving data reliability and supporting more inclusive forms of coastal governance through real-world examples. The final part highlights emerging trends such as IoT-enabled monitoring, cloud-based geospatial processing, web-based decision support systems, and citizen-driven environmental tracking.

The book offers significant academic and practical value by bridging theory and application, supporting evidence-based policy, and equipping researchers, practitioners, decision-makers, scientists, professionals, students, and coastal studies enthusiasts with accessible tools and frameworks to address contemporary coastal challenges and promote resilient and sustainable coastal futures.

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