

Research Report

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Operational Overview of the Application of Remote Sensing and Hydrography for Coastal Zone Management

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Abstract

Understanding the need of sustainable development in coastal zones requires specific knowledge of the specifics of the environmental as well as socioeconomic considerations related to Coastal Zone Management. Modern Environmental Management systems requires effective ways for the diagnosis of problems and identification of issues that affect coastal zones, in order to be able to handle diverse data and information about specific coastal zones. The application of Remote Sensing and Hydrography provide strong vertical as well as horizontal integration for Coastal Zone Management, specifically issues related to Ecosystem and Environmental Management, as well as economical and developmental issues. Bathymetric Remote Sensing provides capabilities of seamlessly addressing issues related to land cover, land use for coastal or near shore zones. Integrating this data with data from Singlebeam and Multibeam echo sounder can provide detailed water depth information that are useable as bases for building 3D models for underwater environments. 3D coastal models are of great benefit in coastal development activities, such as infrastructure construction, as well as facilities establishments. This report will provide a general overview of the key benefits from Remote Sensing and Hydrography integration for coastal zone management.

Keywords: Coastal Management, Globalview, Hydrography, Lidar, Multibeam Echosounder, Remote Sensing, Sonar, Electromagnetic Radiation, Spectral bands

Introduction

The coastal area is defined as the area between the maritime boundary towards land and the land boundary towards the sea. The coastal area has gained in importance due to environmental and economic resources and population concentration. Coastal zone monitoring is an important task in environmental protection, while coastline detection is fundamental for coastal management. Coastal management requires up-to-date accurate information since coastal movements are of primary importance in evaluating coastal erosion. Remote sensing plays a significant role in coastal observation as it is one of the most valuable tools used for detecting and monitoring coastlines.

The increasing man-made impacts and effects of climate change are making our coastlines more vulnerable to coastal risks including erosion and flooding. These impacts are far-reaching and are already changing the lives and livelihoods of coastal communities. In addition, they could further threaten valuable ecosystems and damage industries, such as fishing, tourism and shipping. We need to better understand the ongoing processes in

this complex and sensitive system of nature-human interactions and to reduce the negative impacts of coastal change.

Coastal Zone

The coastal zone is the confluence of land-based ocean waters, including places on the strip along with adjacent coastal waters; Coastal areas can also include river deltas, coastal plains, wetlands, beaches, sand dunes, coral reefs, coastal mangrove forests, shallow lakes and other coastal features.

The coastal environment is the region most affected by climate change, such as those that include marine coral reefs, rising ocean levels, and marine biodiversity, as these areas are affected by increased global warming pressures. The global consensus is on the UN 2030 Agenda. The Paris Convention on Climate Change of COP21 is the guiding light in light of the most complex situation facing the planet today, and in any region such as the coastal zone, which is one of the world's most important ecosystems [1]. Threatened by rising sea levels, we can plan and even adapt to adaptability.

Coastal development requires the change of natural systems, and their development may vary in scope, intensity and sustainability; actual change of natural environments is one of the most serious threats to coastal areas.

Many of the world's largest cities are located in coastal areas: in terms of spatial planning, coastal locations have many advantages (mainly related to transport / maritime transport) as well as beach amenities for recreation, as well as benefits to the local economy) At the same time, the challenges facing development in coastal areas are increasing, and the area factor is one of the most prominent problems facing growing urban agglomerations in coastal areas: the space available for urban development within any coastal zone is only half of the total area. Water resources are also linked to the problem of coastal development in coastal areas. A city located on the banks of a major river collects only half the amount of any other city far from the coast, and with the depletion of groundwater resources. Coastal cities are exposed to saltwater intrusion into freshwater which may pose an additional risk to groundwater resources; other problems affecting coastal water quality include waste management (ocean drainage) resulting from industrial activities, the energy sector and desalination. Water and sewage (whether or not such waste is treated), The challenges posed by climate change include rising sea levels and an expected increase in the frequency and intensity of extreme weather events (coastal storms and tsunamis) that pose a threat to near-shore coastal areas.

Remote sensing and GIS

Remote sensing refers to the set of techniques and processes through which information can be obtained from a phenomenon on the surface of the Earth without direct physical contact between the phenomenon and the data capture device.

GIS is defined as a static technology that works with a wide range of publicly available business solutions and tools for wide use in spatial data management and analysis, These solutions and tools are also used to effectively report the spatial distribution of any phenomena; at the same time with high accuracy (in determining time and space), remote sensing data has become accessible to many useful data and GIS, which customers use from Through constantly-developed devices from their workplaces or through their personal computers, laptops or mobile phones, These systems have become a tool for processing and displaying these data; as standards become more standardized (open geographic information systems), which in turn enhance interoperability, the potential for practical use of these systems increases considerably beyond the need to integrate many data sources, Web solutions facilitate access and distribution; more GIS users are using mobile phones than conventional computers.

Remote sensing for coastal zone management

The use of remote sensing technology for coastal zone management has grown rapidly since the launch of the first remote-sensing Earth observation satellite in 1972 (Lansat1).

Many applications have shown the usefulness of remote sensing, especially in shallow coastal waters (5 to 10 meters). Examples of such applications include water quality analysis, assessment of beaches, sea grass, chlorophyll and benthic habitat planning. Most of these applications use digital image classification (vector, non-vector, blur, etc.). The interpretation of digital images depends on key elements of image interpretation such as tone, texture, size, shape, pattern, shadow, location, and correlation.

The first level of information relevant to the decision for coastal zone management is the question of location and reason, which already illustrates the transition from description to analysis.

Related Work

El-zeiny et al., [2] The study targeted Lake Burullus, which is connected to the Mediterranean Sea through the Burullus lake, which is the second largest natural lake in Egypt. The study dealt with the evaluation of water pollution in the study area by analyzing the space visuals using Envi software and treating it with Arc map software. The study found that household and agricultural discharge are the most important causes of pollution of the lake water in both the southwestern part and the northeastern part of the study area.

Gajbhiye [3] Using remote sensing technology, GIS and satellite imagery to determine the volume of water discharge, systems, density and density of bifurcation in the basin and understanding of hydrological behavior showed that the drainage density is high.

Conclusion

GIS is a powerful tool for coastal area analysis and management support, the emergence of state-of-the-art portable mobile devices and the rapid availability of spatial data sources have led to more sophisticated applications; to support the application of GIS to support more complex management decisions; To analyze the landscape and improve policy support and management decisions.

The use of RS and GIS for coastal zone management provides a mechanism for sharing and avoiding duplication of data, In addition to being a cost-effective system, there is a possibility of transferring big data on coastal management, With 3,000 satellites orbiting the Earth every day to collect photos, send conversations and position, Knowledge of satellite vulnerabilities helps to identify potential risks and develop measures to mitigate them. The introduction of GIS / GNSS / remote sensing for coastal area management in the university curriculum meets all global and local needs and paves the way for the preparation of future generations.

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