



Use of Remote Sensing Technology in Environmental Observation and Resource Management

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DESCRIPTION

Coastal zones represent some of the most dynamic and productive areas on Earth. These regions support a wide variety of ecosystems, including mangrove forests, estuaries, coral reefs, salt marshes and seagrass meadows. At the same time, they provide important economic benefits through fisheries, tourism, transportation and urban development. Rapid population growth, industrial expansion, climate variability and natural hazards have increased pressure on coastal environments, making continuous observation and effective resource administration increasingly important. Remote sensing technology has become a valuable tool for collecting, analyzing and interpreting information about coastal regions across large spatial areas and extended time periods.

Remote sensing refers to the acquisition of information about objects or areas from a distance, typically through sensors mounted on satellites, aircraft, drones or other platforms. These sensors record reflected or emitted electromagnetic radiation from the Earth's surface, allowing scientists and resource managers to monitor environmental conditions without direct physical contact. The ability to obtain repeated observations over extensive coastal landscapes has significantly improved environmental assessment and decision-making processes.

One of the major contributions of remote sensing technology in coastal observation is shoreline monitoring. Coastal shorelines continuously change due to wave action, tides, storms, sediment movement and human activities. Traditional field surveys often require considerable time and financial resources, especially for large coastlines. Satellite imagery enables researchers to compare shoreline positions over different periods and detect erosion or accretion patterns. Such information assists planners in identifying vulnerable locations and implementing suitable coastal protection measures. Remote sensing is also widely employed in monitoring coastal water quality. Water bodies

near the coast are often affected by pollutants from agricultural runoff, industrial discharge, sewage release and sediment transport. Satellite sensors can detect variations in water color, turbidity, chlorophyll concentration and suspended particulate matter. These observations provide useful indicators of environmental health and support efforts to maintain water quality standards. Continuous monitoring helps identify pollution events and enables authorities to respond more efficiently to environmental concerns.

The management of coastal ecosystems greatly benefits from remotely sensed data. Mangrove forests, for example, provide habitat for numerous species while protecting shorelines from erosion and storm impacts. Satellite images can be used to map mangrove distribution, estimate vegetation density and identify areas experiencing degradation. Similar approaches are applied to coral reefs and seagrass beds. Regular observations assist conservation programs by revealing ecosystem changes and supporting restoration initiatives where necessary.

Climate-related impacts on coastal zones have become an area of significant concern. Rising sea levels, increasing storm intensity and changing temperature patterns influence both natural ecosystems and human settlements. Remote sensing technology offers valuable datasets for studying these changes. Satellite altimetry can measure sea surface height, while thermal sensors monitor temperature variations. Long-term records derived from remote sensing provide important evidence for understanding environmental trends and evaluating adaptation strategies designed to reduce coastal vulnerability.

Another important application involves disaster assessment and emergency response. Coastal regions are frequently exposed to hurricanes, cyclones, storm surges, floods and tsunamis. During and after such events, remote sensing systems can quickly capture information regarding affected areas. High-resolution imagery helps identify damaged infrastructure, flooded zones and altered landscapes.

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CONCLUSION

The importance of coastal zones to environmental stability, economic development and human well-being highlights the need for effective observation and resource administration. Remote sensing technology provides a practical and efficient means of monitoring coastal environments, evaluating ecological conditions, assessing risks and supporting informed decision-

making. Through continued technological progress and increasing availability of satellite and aerial data, remote sensing will remain an essential component of coastal environmental observation and resource management. Its capacity to provide comprehensive spatial information contributes significantly to the protection, conservation and responsible utilization of coastal resources for present and future generations.