Exploring the Utility of Remote Sensing to Address Coral Reef Management Concerns in
Developing Countries:
A Case Study of Bunaken National Park, Indonesia

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The world's coral reefs are at risk; this is no longer in question. Recent estimates suggest that significant reef degradation has occurred in over 93 countries, the majority of which are among the world's least developed. Within the country of Indonesia, coral reefs provide products and services for numerous coastal and inland communities. However, coral reefs have increasingly been impacted by coastal development, land- and marine-based pollution, and destructive fishing practices. As a result, reef health has considerably declined posing a challenging task for coral reef managers.

To address questions associated with reef location and change, remote sensing techniques are often utilized, particularly in the establishment of baseline maps of coral reef spatial location and extent. In addition, coral reef geomorphological maps and coral reef benthic habitat maps have become available and useful in locating reef features. Within the field of coral reef management, satellite images have been used in the construction of marine protected areas and zonation plans, however, specific and appropriate applications of remote sensing techniques to coastal management objectives remains obscured.

In this study, we focus on Bunaken National Park, Indonesia. The park was created in 1991 and encompasses over 30,000 residents in 22 villages. The objective of this study is to investigate the coastal management strategies currently in place for this park, and for which strategies remote sensing technology may contribute. With this study, we wish to advance the utilization of remote sensing to address urgent coral reef management concerns in developing nations.

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Outline

- Coral Reefs
  - Inherent Biology
  - Global Distribution
- Managing Indonesia's Coral Reefs
  - National Policy
  - Bunaken National Park
- A Place for Remote Sensing
  - Capabilities and Complexities
  - Working with Managers
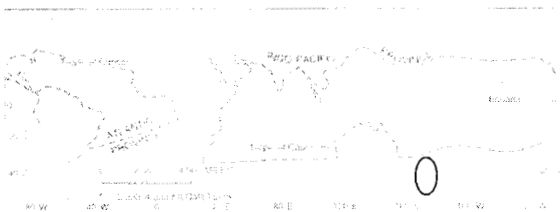- Conclusions

Coral Reefs

Coral reefs are massive limestone structures that provide shelter for nearly one quarter of all marine life. Coral reefs are home to over 4,000 different species of fish, 700 species of coral, and thousands of other plants and animals.

Coral Polyp to Coral Reef
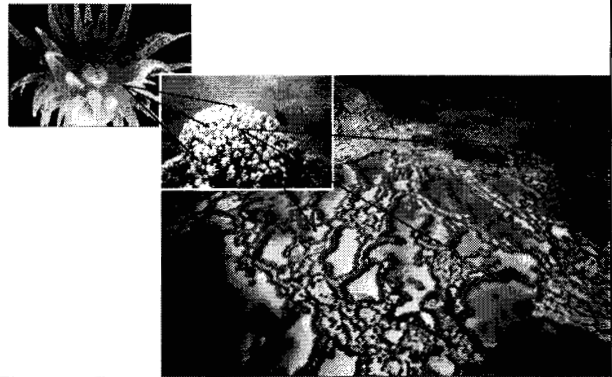
Coral Reefs Around the World

Estimated that reefs cover approx. 2×10^6 km^2 of tropical oceans

Threats to Coral Reefs

- 58% of the world's reefs are at risk; defined at having medium to high risk.
- 30% are already severely damaged and close to 60% may be lost by 2030.
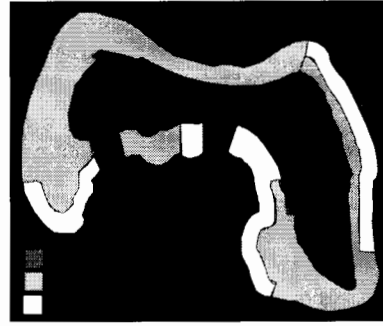- Threats can be categorized as being of either natural or anthropogenic origin.

Indonesia's Coral Reefs

- Region of highest coral reef biodiversity
- Multiple 'paperparks'
- Decentralization to local governments
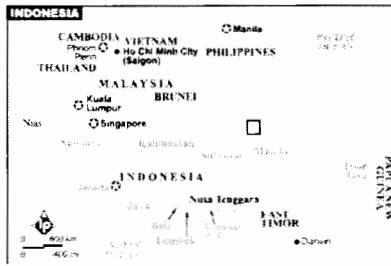
Bunaken National Park: Management Through Zonation
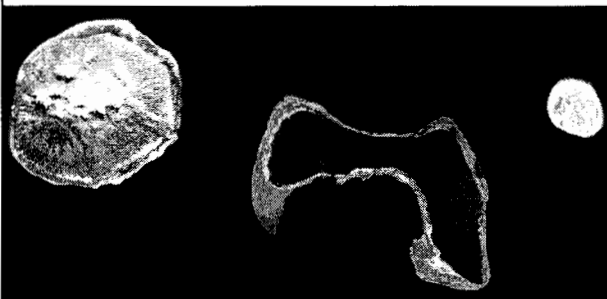

A Place for Remote Sensing

Remote sensing can be defined as:

"The science and art of obtaining information about an object, area, or phenomenon through the analysis of data acquired by a device that is not in contact with the object, area, or phenomenon under investigation."
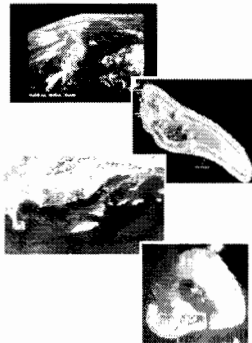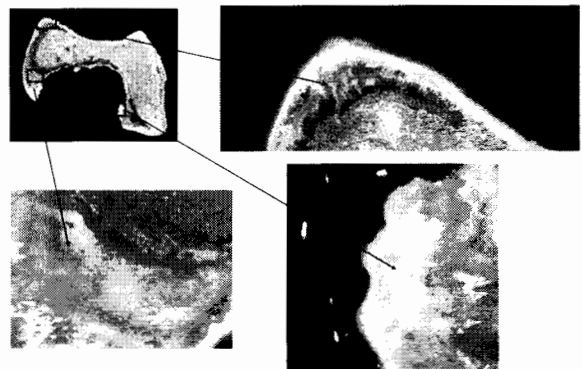

Satellite Imagery

IKONOS Satellite Image of the Southern Island in Bunaken National Park, Indonesia

Complexities with Imagery

Working with Managers

Conclusion

> MPA development and maintenance can be assisted by remote sensing.
> Input from managers is essential to integrate remote sensing into the management context.
> Remote sensing researchers must adopt 'action research' techniques.

Acknowledgements