



Over one-half
of the world's population lives
within **100 kilometres**
of the sea.



Modelling and Decision Support Working Group

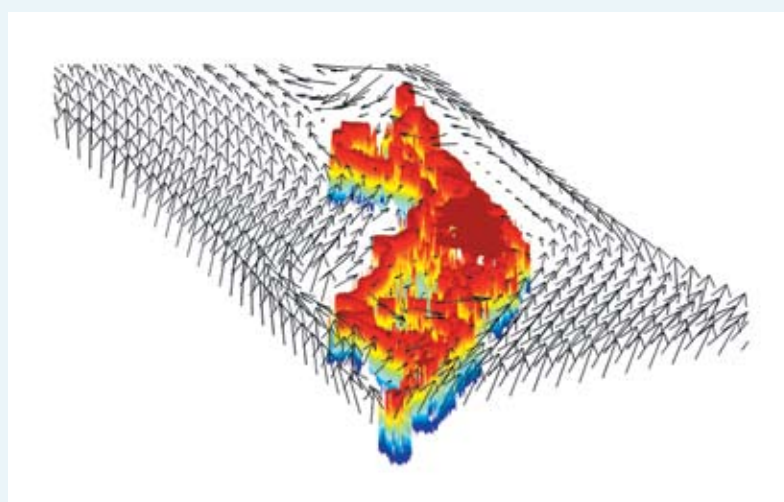
Improving coral reef management decisions through computer modeling

Management implications

Modeling is an important management technology that allows decision makers and reef users to see the dynamics of the whole system – the biophysical and socio-economic parts. Models can be organized so that the results of scenarios of 'what if' questions can be computed and visualized immediately.

The purpose of the Coral Reef Targeted Research & Capacity Building for Management Program's Modelling and Decision Support Working Group (MDSWG) is to create an integrated scientific understanding of the way in which people interact with coral reefs.

The MDSWG research aims to develop modelling resources to enable reef managers to work with simulations for their own areas, better understand the links between local, regional and global processes and access realistic scientific and economic data over the Internet.



The problem

Coral reefs – and the people that depend on them – have a big problem: The problem of lots of problems crashing together.

And what problems they are!

- Global problems like climate change and mass tourism.
 - Regional problems like overfishing and agricultural runoff.
 - Local problems like sewerage pollution and dredging.
- These problems can't be solved one at a time
- Because while we try to solve one, the others will just get worse (e.g. a dollar spent on overfishing is a dollar not spent on climate change).
 - And because solving one can actually make another worse (e.g. fixing agricultural pollution from the hinterland can increase sewerage pollution from the city by shifting populations).

The estimated bathymetry (or bottom topography) to 30m around the major island group of Palau. The darkest red represents land and the top of the barrier reef, while blue indicates 30m deep water. The bathymetry was produced using satellite data combined with measurements in the field. Surface currents typical for the Decemnr-March period are illustrated by the vectors

And they can't be solved in one place and not another, because coral reefs are connected

- By ocean currents
 - Sewerage diverted from one reef will affect another;
 - Overfishing on one reef depletes its neighbours of new baby fish.
- By regional economic processes
 - Closing one reef to fishing shifts the pressure to other reefs.
- And by global markets
 - Industrial fishing and mass tourism destroy reefs in one area and then move on to new ones.

The Coral Reef Targeted Research & Capacity Building for Management Program (CRTR) is a leading international coral reef research initiative that provides a coordinated approach to credible, factual and scientifically-proven knowledge for improved coral reef management.

The CRTR Program is a proactive research and capacity building partnership that aims to lay the foundation in filling crucial knowledge gaps in the core research areas of Coral Bleaching, Connectivity, Coral Diseases, Coral Restoration and Remediation, Remote Sensing and Modelling and Decision Support

Each of these research areas are facilitated by Working Groups underpinned by the skills of many of the world's leading coral reef researchers. The CRTR also supports four Centers of Excellence in priority regions, serving as important regional centers for building confidence and skills in research, training and capacity building.

The CRTR Program is a partnership between the Global Environment Facility, the World Bank, The University of Queensland (Australia), the United States National Oceanic and Atmospheric Administration (NOAA) and approximately 40 research institutes & other third parties around the world.

October 2006

Is there a solution?

A real solution to the coral reef problem must:

- Attack all the problems simultaneously;
- Understand how local problems affect global problems and vice versa;
- Understand how social and economic problems affect biological and physical problems and vice versa;
- Explore the effects of different management strategies on all problems; and;
- Allow managers to learn and adapt.



Image: Ernesto Weil

Goals

We are building a series of computer simulations of coral reefs to help managers make better decisions:

- We are working with managers, at local, regional and global levels, to make sure these simulations are relevant to their needs.

The simulations capture the way reefs work:

- How they grow under normal conditions;
- How they collapse in response to stresses and pressures, and;
- How they interact with the human communities that use them.
- They are 'flight simulators' for coral reef managers.

Importantly, these simulations will allow managers to look at reefs locally, regionally and globally,

- So that the full effects of management decisions can become apparent.

→ That is, so that the effects of global management decisions, say to do with global warming, can be related to the effects of local management decisions, such as declaring an MPA.

Progress to date

We have built and tested the fundamental 'engine' to drive the simulations.

- One part of this engine captures the way coral reefs work – the biology and physics.
- The other part captures the way people use reefs – the economics and sociology.



Aerial photograph of hotel development in Cancun, Mexico adjacent to coral reefs
© Wolcott Henry 2001

We are now working on simulations

- That managers themselves can 'drive';
- That work at local, regional and global scales.



Image: Ernesto Weil



Image: Ernesto Weil

Modeling and Decision Support Working Group
Improving coral reef management decisions
through computer modeling
- RESEARCH UPDATE

Further Information

Modelling and Decision Support Working Group
Australian National University

Chair: Dr Roger Bradbury
Email: roger.bradbury@anu.edu.au

Co-Chair: Dr Pascal Perez
Email: pascal.perez@anu.edu.au

Project Executing Agency:
Coral Reef Targeted Research & Capacity Building for Management Program
C/O Centre for Marine Studies
The University of Queensland
St Lucia QLD 4072
Australia

Telephone: +61 7 3365 4333
Facsimile: +61 7 3365 4755
Email: info@gefcoral.org