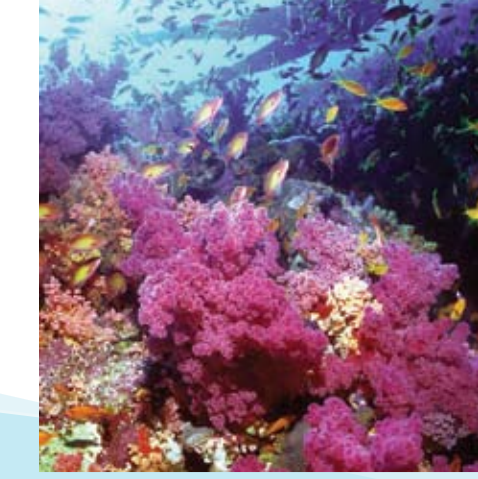
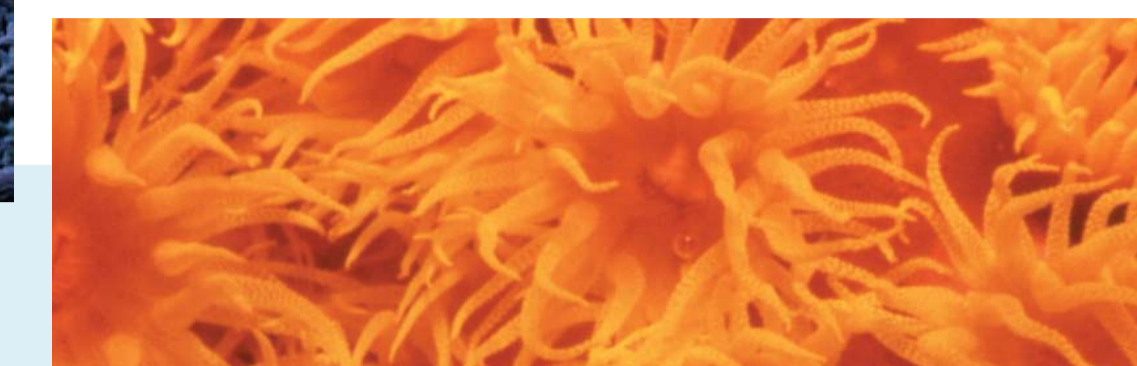


Over one-half of the world's population lives within **100 kilometres of the sea.**



## Coral Reef Targeted Research & Capacity Building for Management Modelling and Decision Support Working Group



# Improving coral reef management decisions through computer modelling



image: Ernesto Weil

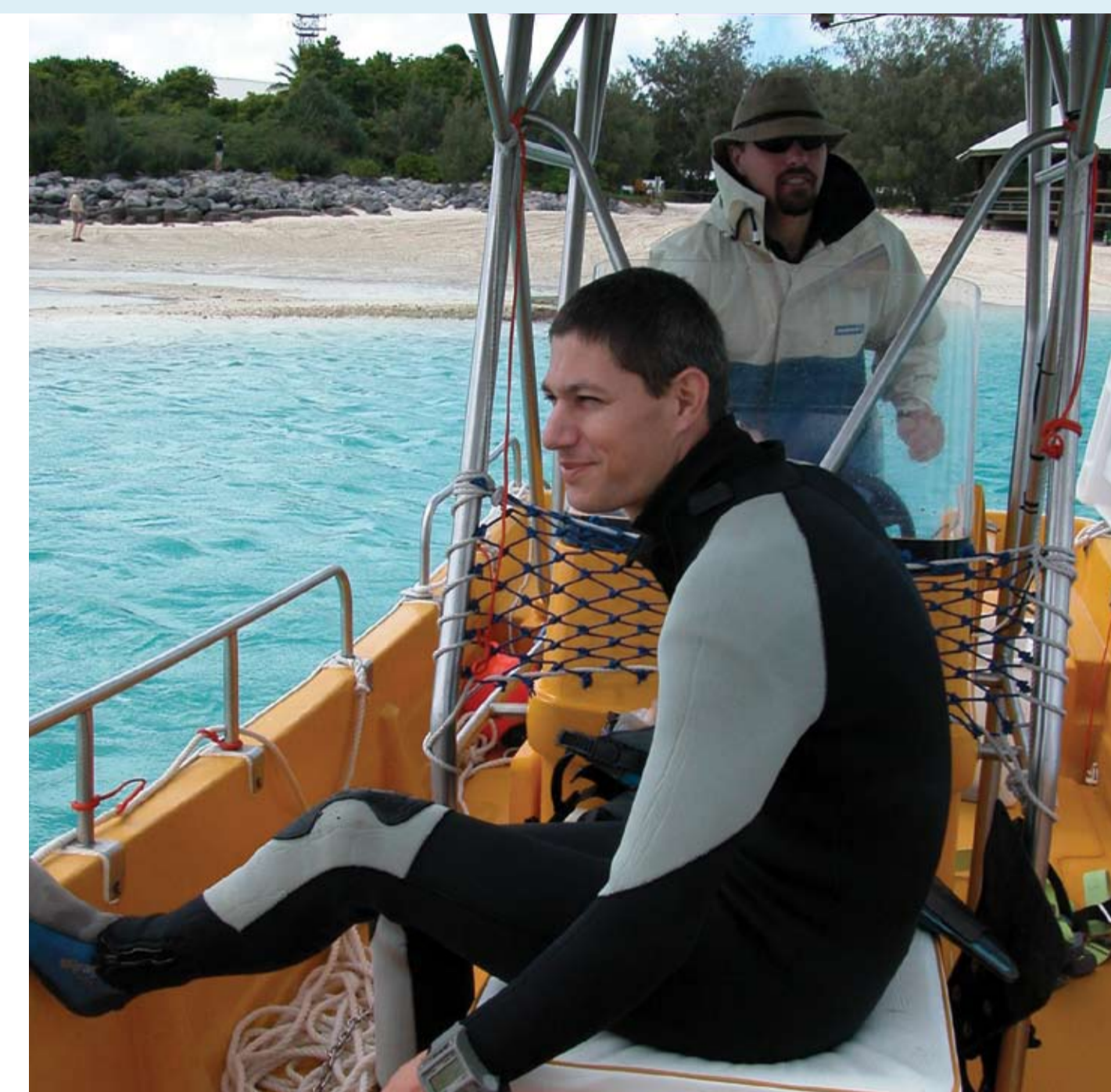
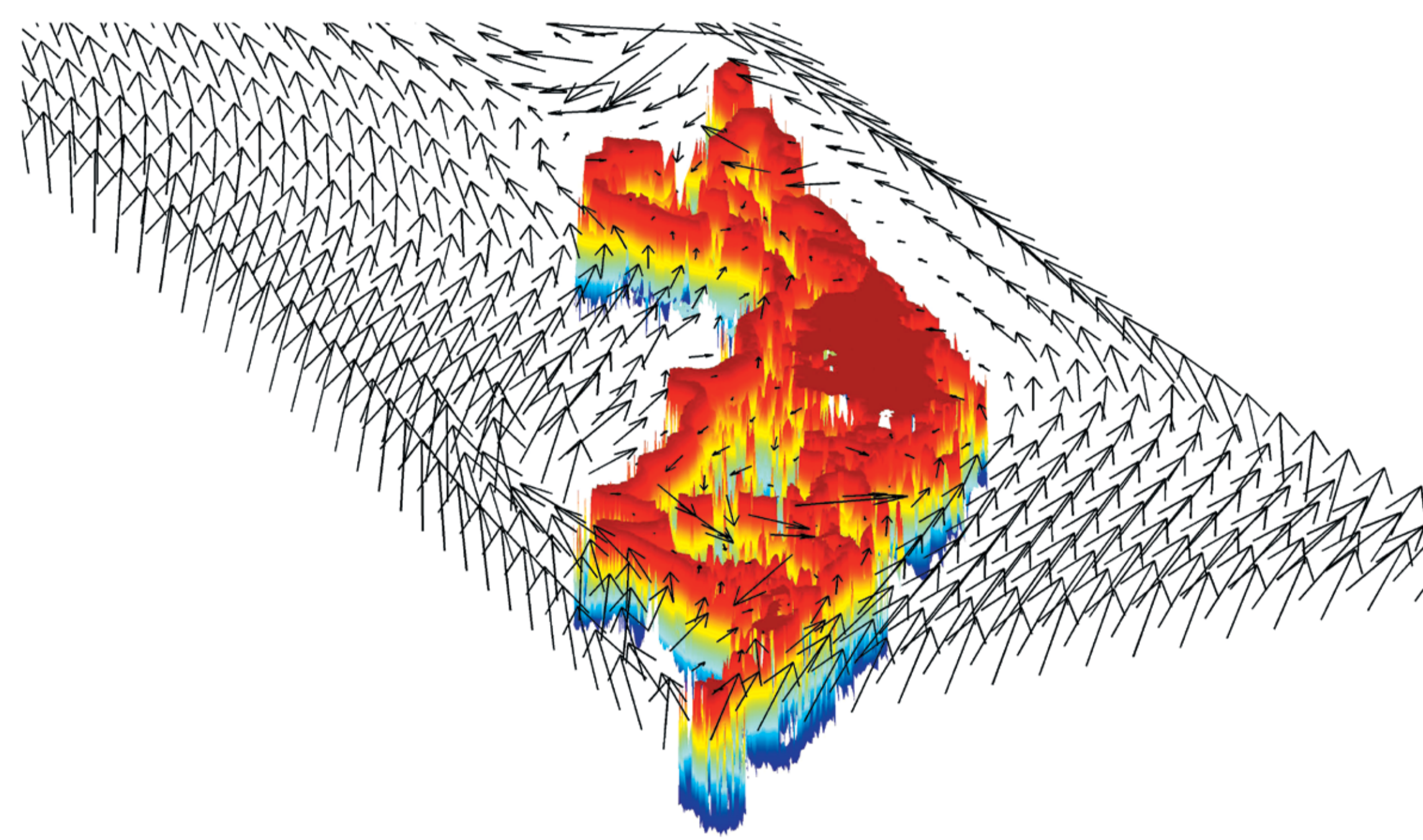


image: Ernesto Weil



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### Improving coral reef management decisions through computer modelling

#### 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).

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.

#### 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.**
- **Allow managers to learn and adapt.**

### 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.**

And, 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.

## Implications for Coral Reef Management

Managers will be able to work with simulations for their own area and better understand the links between local, regional and global processes to support more meaningful decisions.

We are now working on simulations that managers themselves can 'drive' and access realistic scientific and economic data over the Internet.



image: University of the Philippines

### More information

The University of Queensland is the Project Executing Agency (PEA). More information about the CRTR Program can be obtained from the PEA:

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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 and other third parties around the world. The four sites or Centers of Excellence are **Southeast Asia**: Marine Science Institute of Bolinao, University of the Philippines; **East Africa**: Institute of Marine Sciences, University of Dar es Salaam, Zanzibar, Tanzania; **Mesoamerica/Western Caribbean**: Unidad Academica Puerto Morelos, Universidad Nacional Autonoma de Mexico, Mexico; and **Australasia/South Pacific**: Heron Island Research Laboratory, Centre for Marine Studies, The University of Queensland, Australia.

## 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**

We are now working on simulations

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



image: Ove Hoegh-Guldberg

