Australian Government

Great Barrier Reef
Marine Park Authority

Tackling climate change – from assessment to action in the Great Barrier Reef

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Great Barrier Reef Marine Park Authority

Key messages

Climate change is real

Coral reefs are imperilled

Climate change is affecting the Great Barrier Reef

Action is urgently required

Reduce our climate footprint

Maximise reef resilience

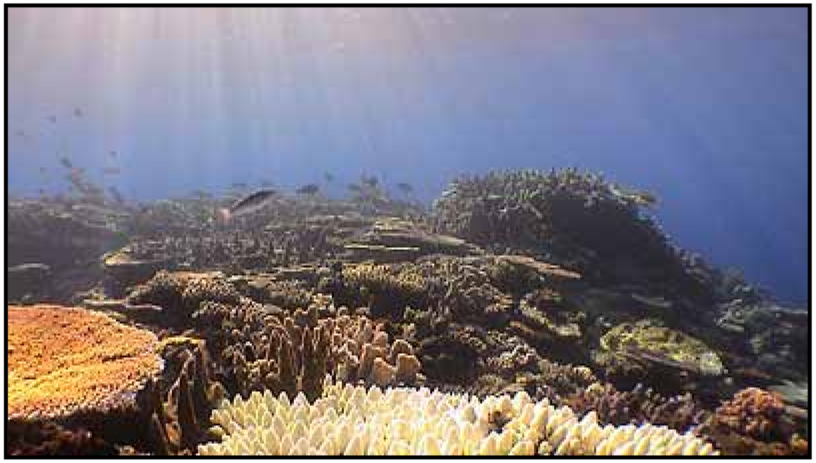
The GBRMPA is taking action

You can help

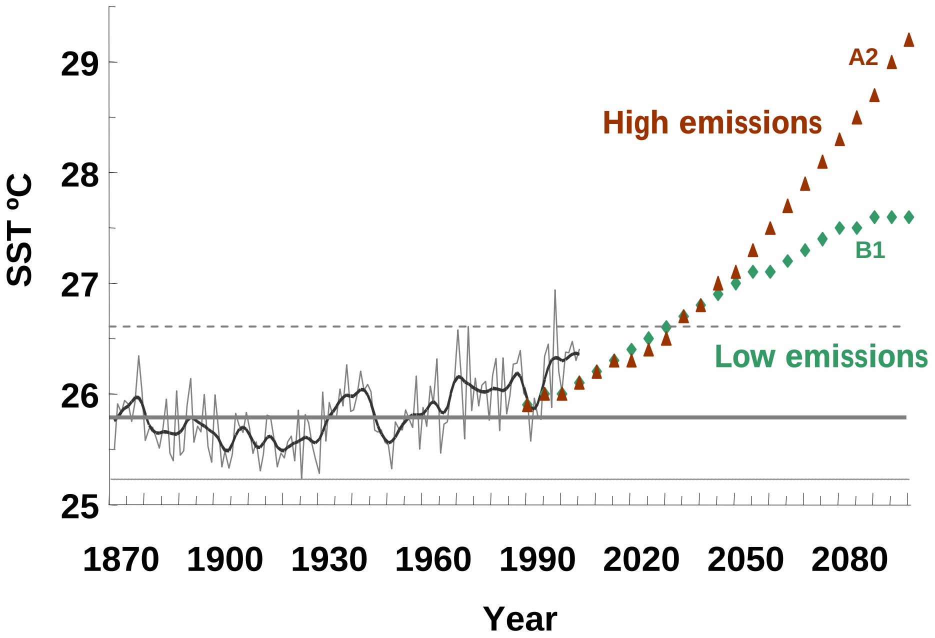
Climate change is real

Climate change is the most serious long-term threat to coral reefs

On the Great Barrier Reef, there is already a trend of increasing sea temperatures



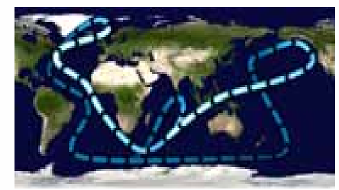
Observed (1871-2005) and projected annual SSTs on GBR

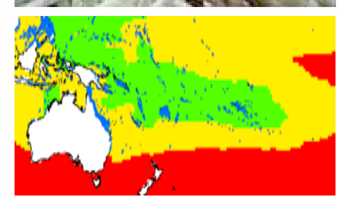


Sea temperatures are projected to increase by 1.1 to 1.2 degrees Celsius by 2050

Coral reefs are imperilled





Issues

Storm frequency & intensity

Precipitation, drought & runoff

Changing circulation

Sea level rise

Sea temperature

Ocean chemistry

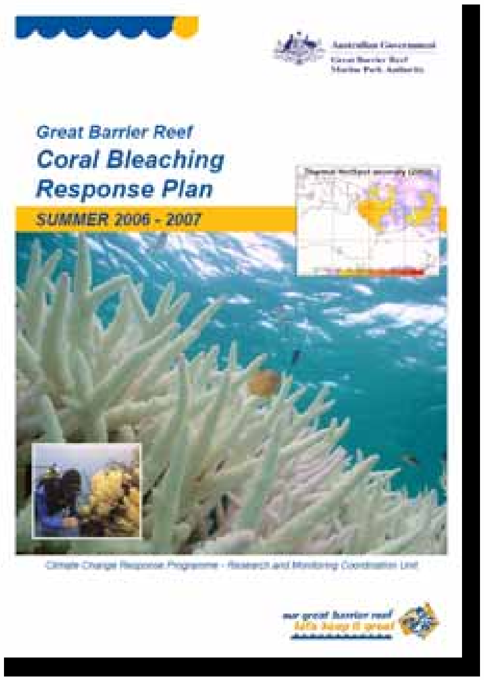
Healthy reef

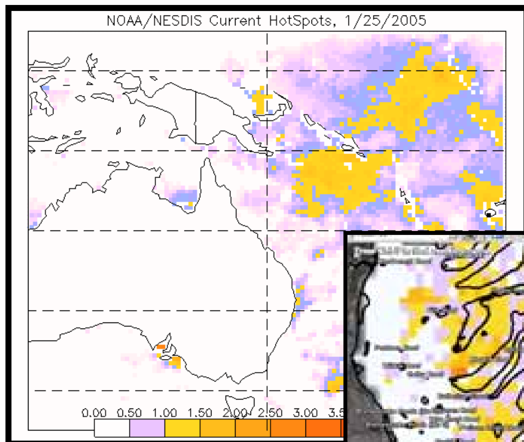

Bleached reef

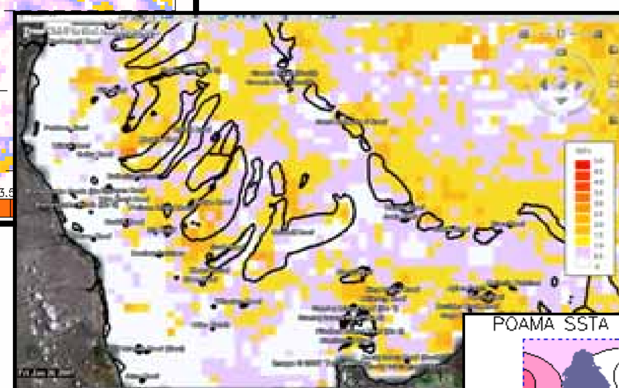

Damaged reef

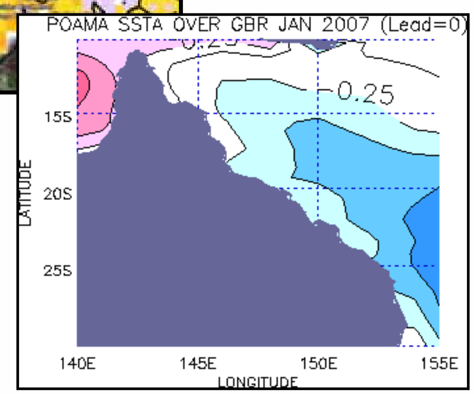
Monitoring bleaching impacts

Coral Bleaching Response Plan





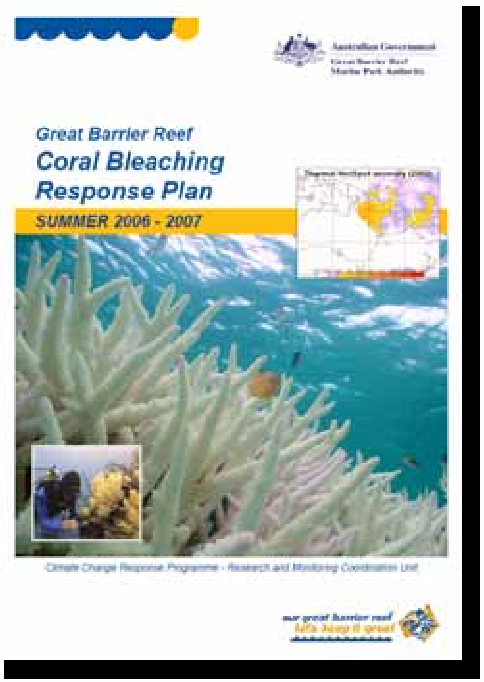




ReefTemp

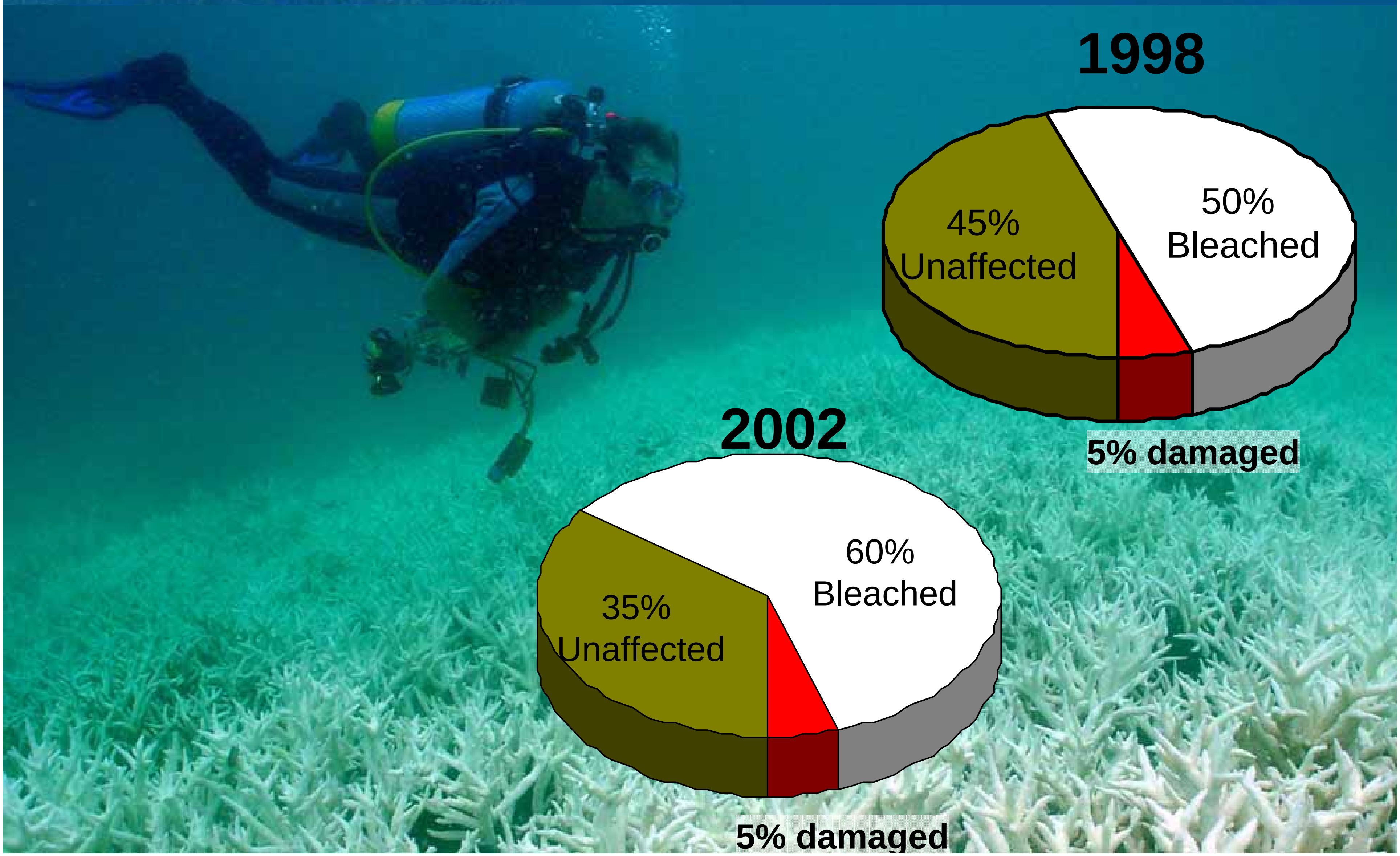
Monitoring bleaching impacts

Coral Bleaching Response Plan



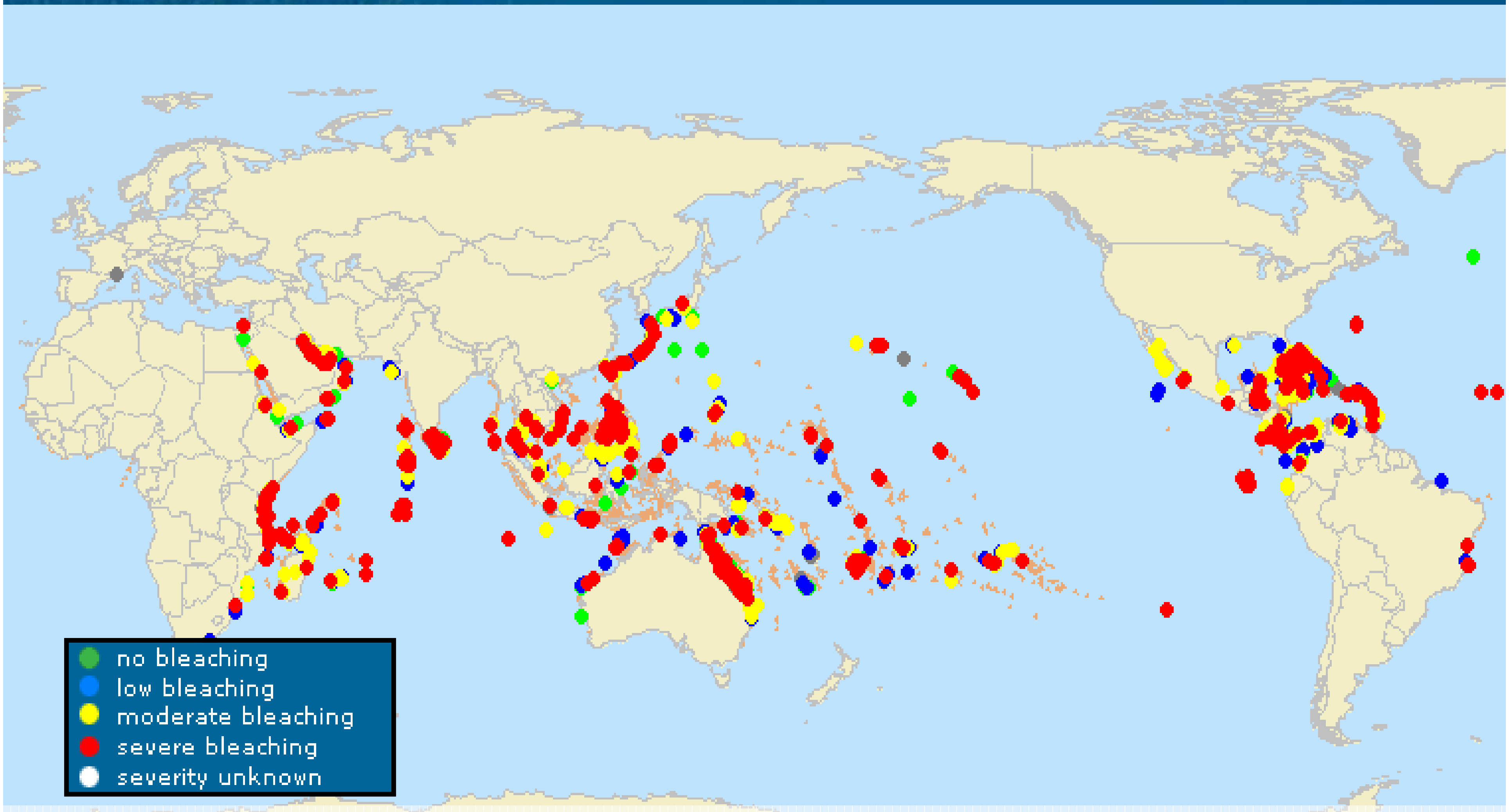
BleachWatch
observe to conserve

Coal bleaching on the GBR



Climate Change Group: GBRMPA

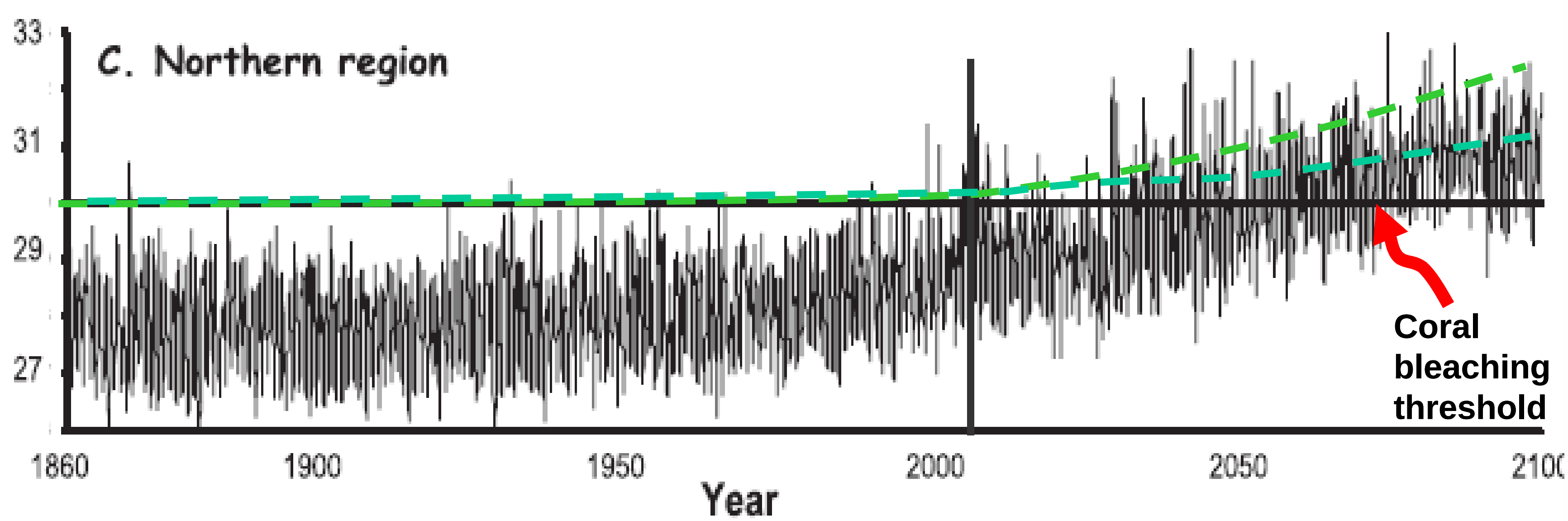
Global impact



16% of world's reefs destroyed

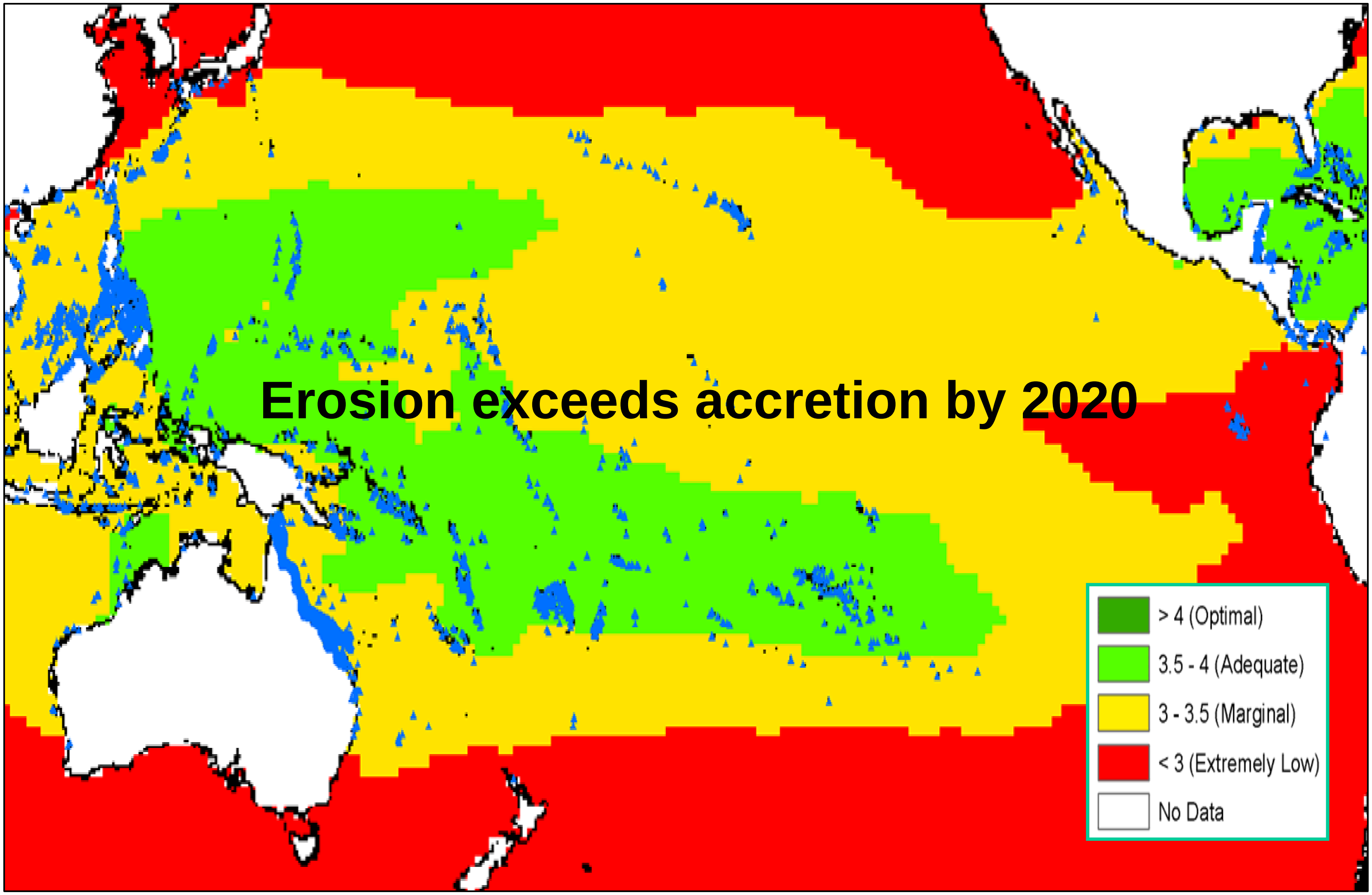
Recovery can take decades

A bleached future

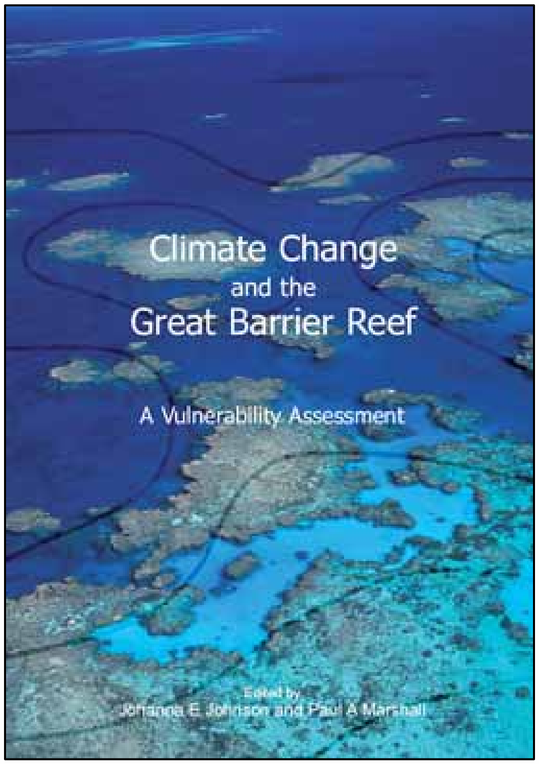


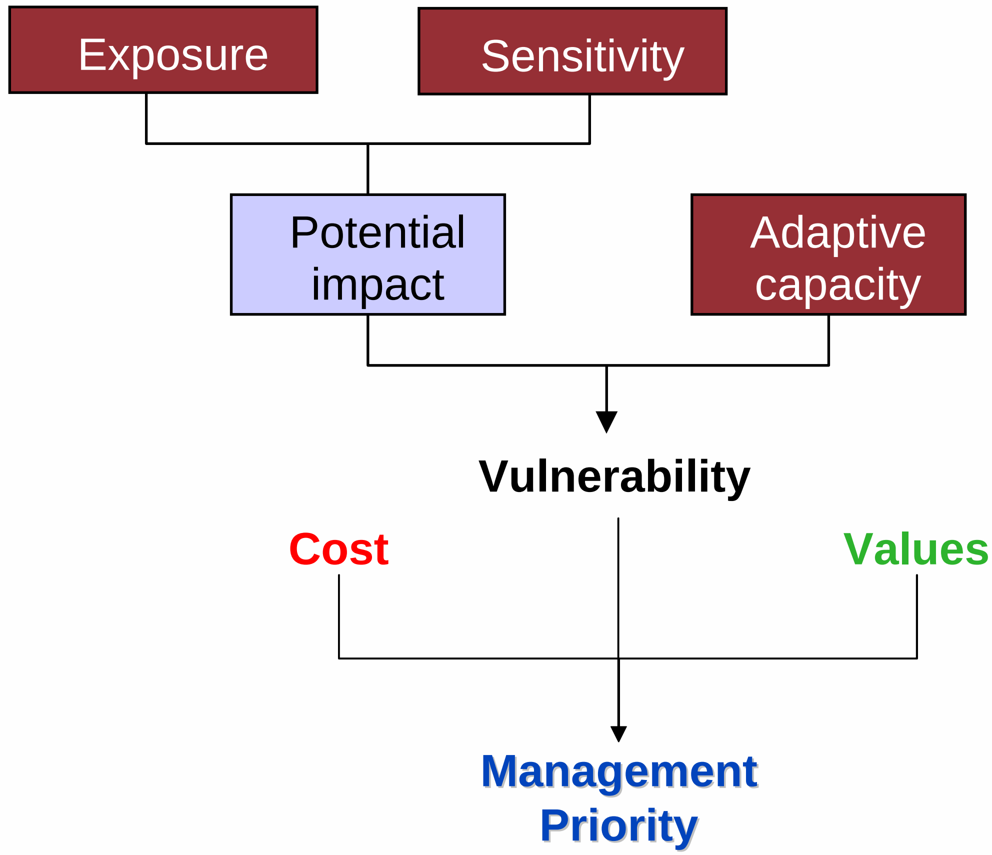
Doubling of CO_2 - Hoegh-Guldberg (1999)

Ocean acidification

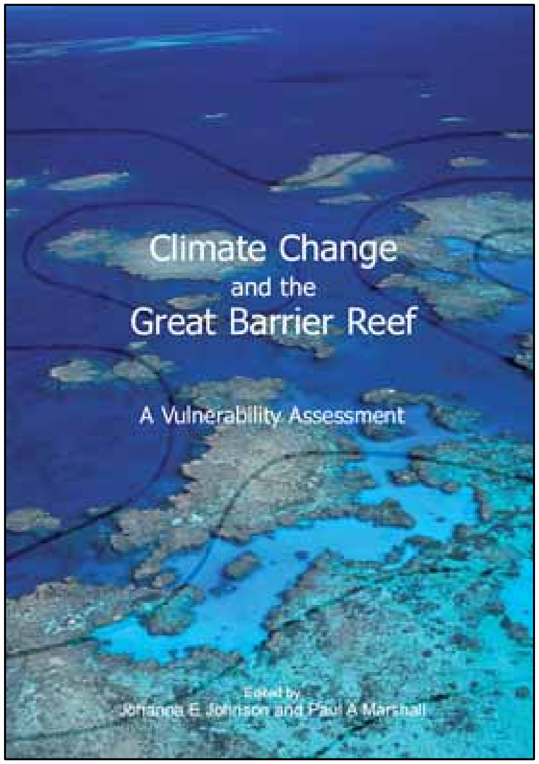


Assessing system vulnerability





Assessing system vulnerability



86 experts

2 years

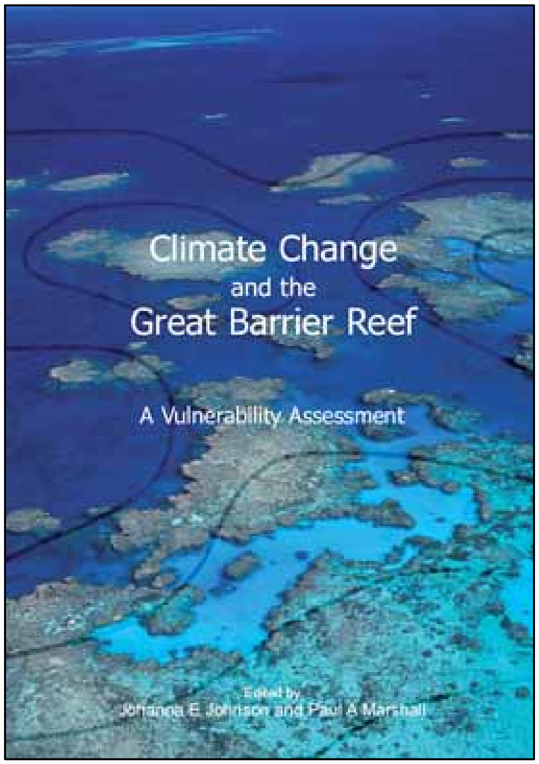
25 chapters

Peer-reviewed

Foreword by Jean-Michael Cousteau

Launched by Environment Minister

Assessing system vulnerability



Introduction
- The Great Barrier Reef (GBR)
- Climate and climate change on the GBR
- Oceanography and climate change
- Resilience, climate change & the GBR

Vulnerability of species and species groups
- Marine microbes
- Plankton
- Macroalgae
- Seagrasses
- Mangroves & tidal wetlands
- Reef-building corals
- Benthic invertebrates
- Fishes
- Sharks & Rays
- Seabirds
- Marine reptiles
- Marine mammals

Vulnerability of GBR habitats
- Coral reefs
- Pelagic systems
- Coasts and estuaries
- Islands and cays
- Geomorphological features
- Palaeoecology

Enabling management
- Industries and communities
- Vulnerability & management implications

Vulnerability of marine microbes

N Webster & R Hill, Chapter 5, *VA*

Key sources of vulnerability

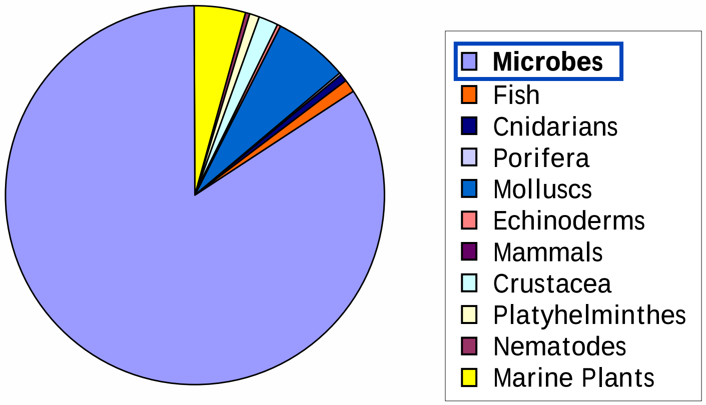
Sea temperature increase
Ocean acidification
Changes to terrestrial runoff

Consequences

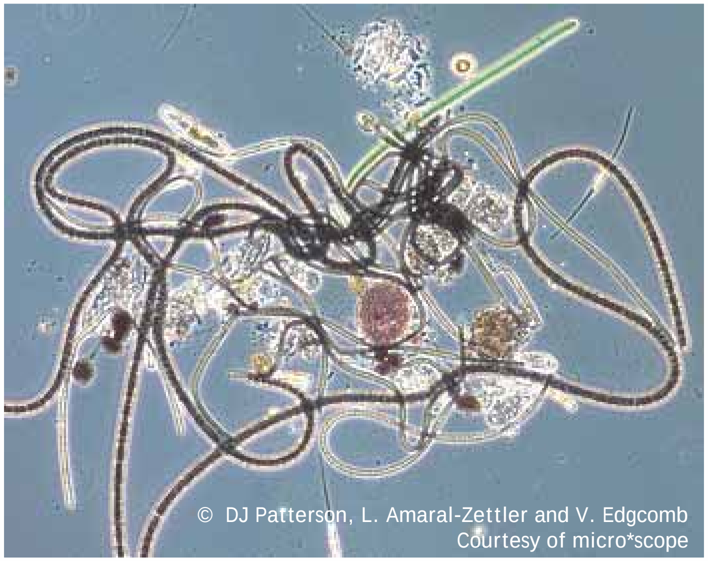
Changes to microbial community composition and function
Effects on primary productivity & nutrient cycling
Increased incidence of disease

Management responses

Incorporate micro-organisms into ecosystem-based models
Improve water quality and reduce nutrient loads

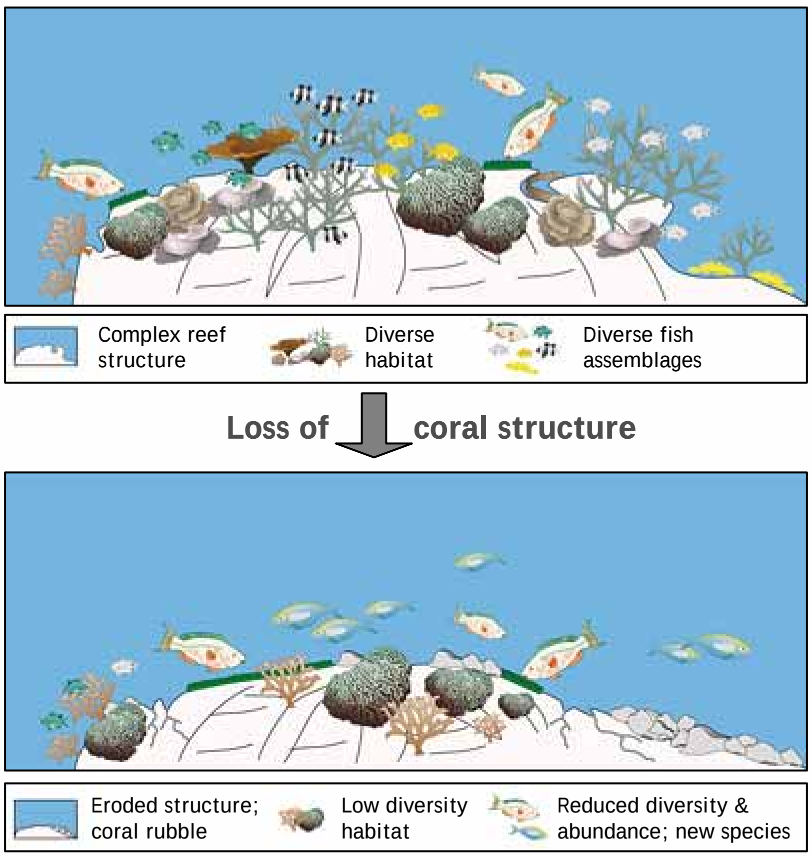


Estimated number of marine species



Vulnerability of fishes

P Munday et al, Chapter 12, VA



Key sources of vulnerability

Habitat degradation

Increasing sea temperature

Changes to ocean circulation

Consequences

Reduced larval dispersal and life cycle changes

Reduced abundance and diversity

Distribution shifts

Management responses

Enhance resilience e.g. improve water quality

Protect fish populations and nursery habitats

Vulnerability of seabirds

BC Congdon et al, Chapter 14, VA

Key sources of vulnerability

Increased sea surface temperature

Altered ocean circulation and upwelling patterns (e.g. ENSO)

Consequences

Reduced food availability

Reduced foraging success

Breeding failure

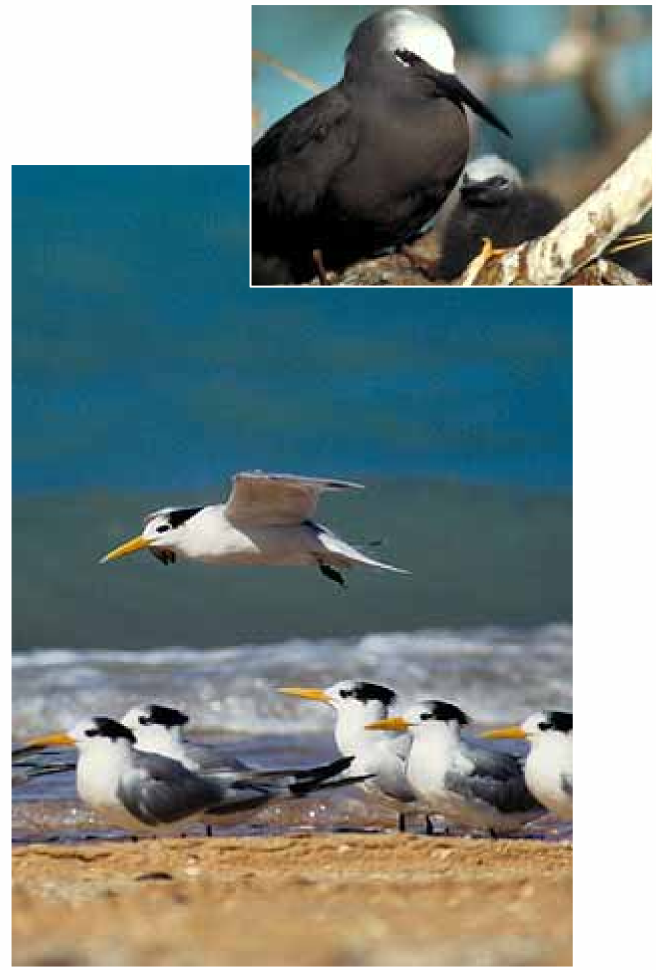
Impacts on marine food web and plant seed dispersal

Management responses

Protect breeding sites and local foraging resources

Protect predatory pelagic fish

Fill critical knowledge gaps required to inform management options



Vulnerability of island flora and fauna

M Turner & GN Batianoff, Chapter 20, VA

Key sources of vulnerability

Increased temp & altered rainfall
Increased intensity of cyclones
Changes in ocean currents & ENSO

Consequences

Alterations to endemic habitat
e.g. reduced rainforest area
Loss of biodiversity (flora & fauna)
Increase in fire, weeds & disease
Loss of breeding and nesting sites

Management responses

Minimise other human-related impacts
Include climate change in all management and site plans

Industries and communities

M Fenton et al, Chapter 21, VA

Facts do not determine behaviour so much as perceptions about those facts.

Niemeyer et al., 2004

GBR Industries and communities

GBR catchment – 850,000 people, rising to 1 million by 2026

Dependent on GBR ecosystem goods and services

Contributed A$6.9 billion in 2005-06

Vulnerability to climate change

Varied perceptions of climate change and impacts

High dependence on ecosystem quality

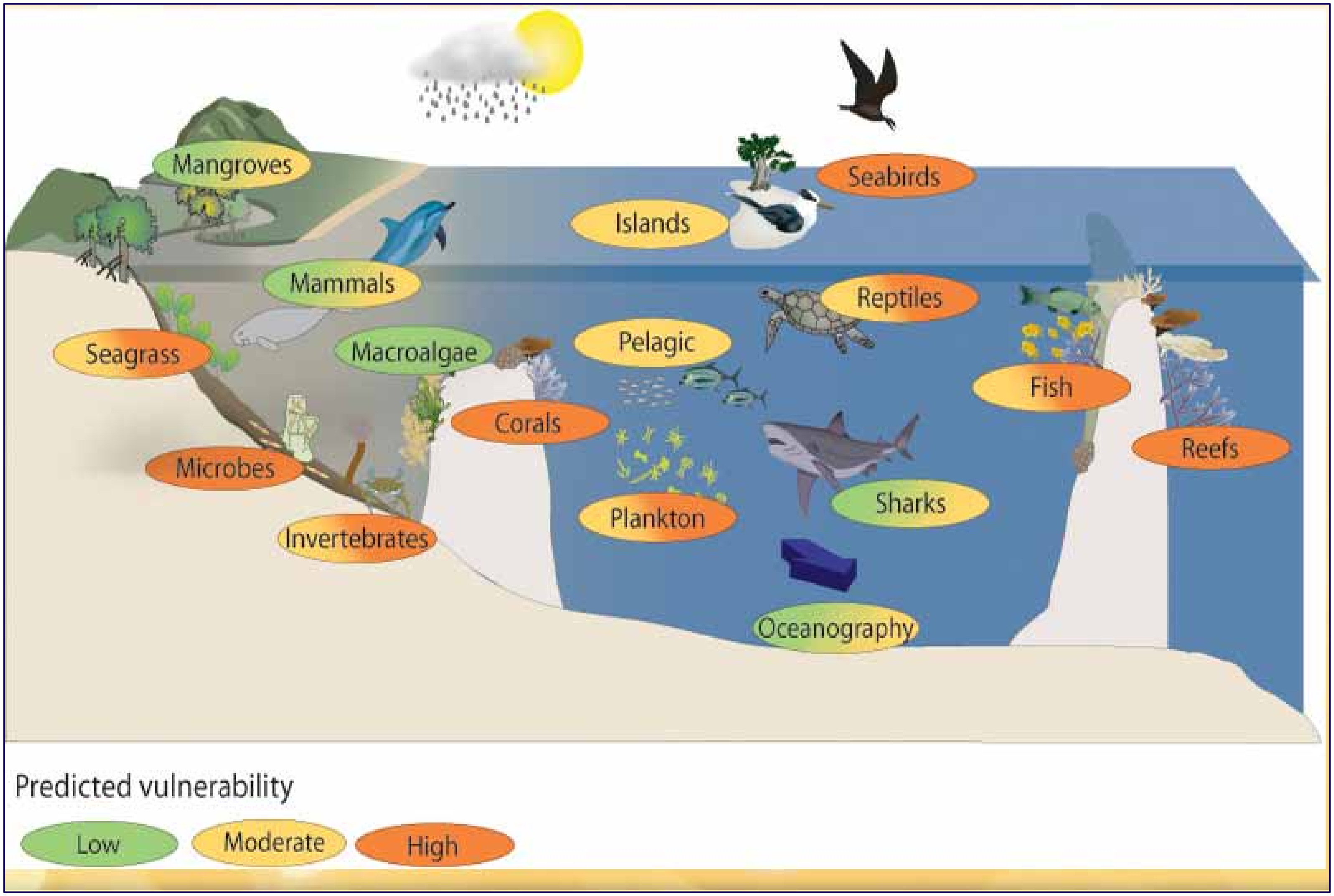
Management responses

Recognise diversity of constructs for climate change & impacts

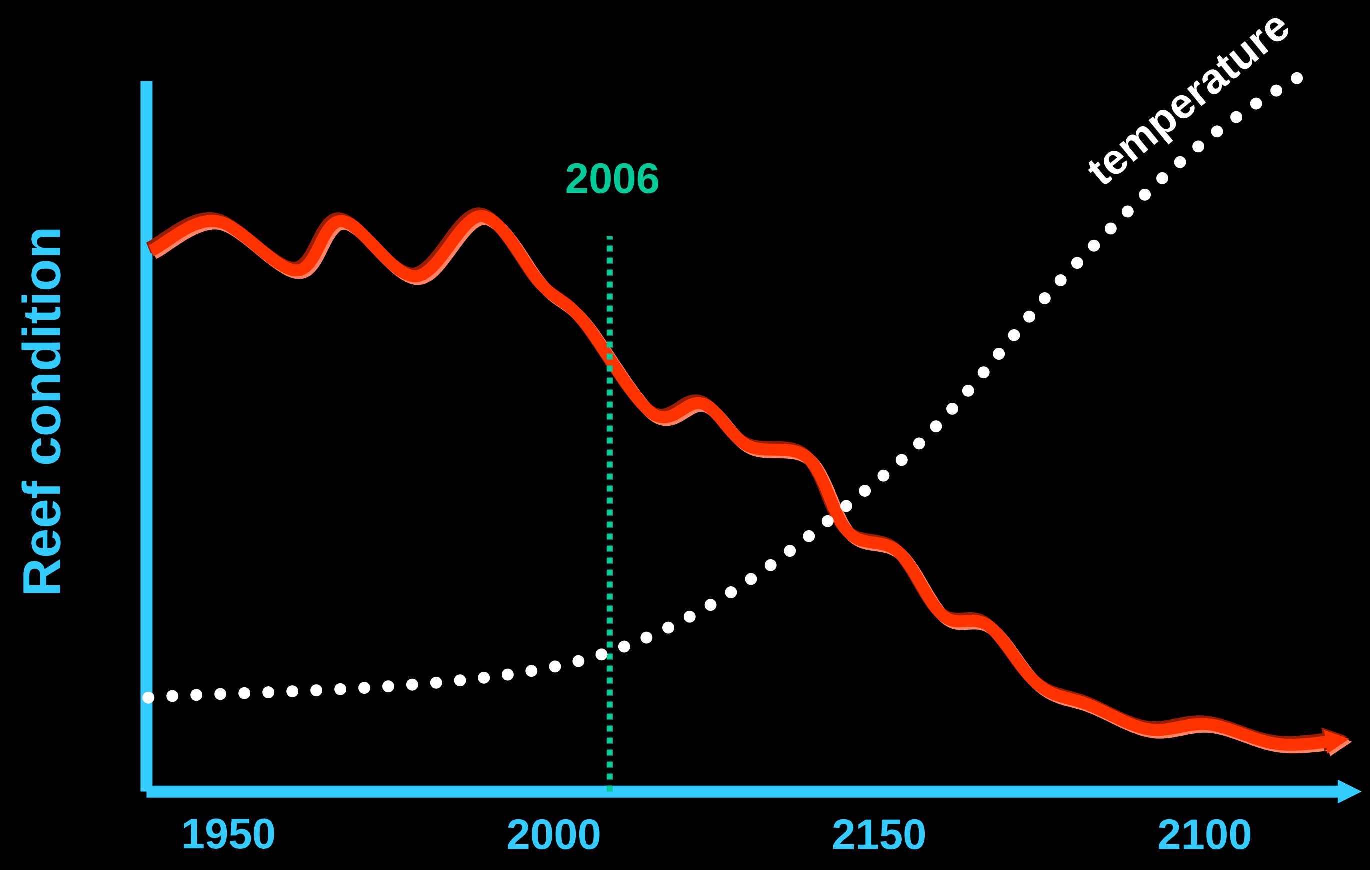
Build adaptive capacity

Sustainable social-ecological system

Summary of GBR vulnerability



Should we just give up??



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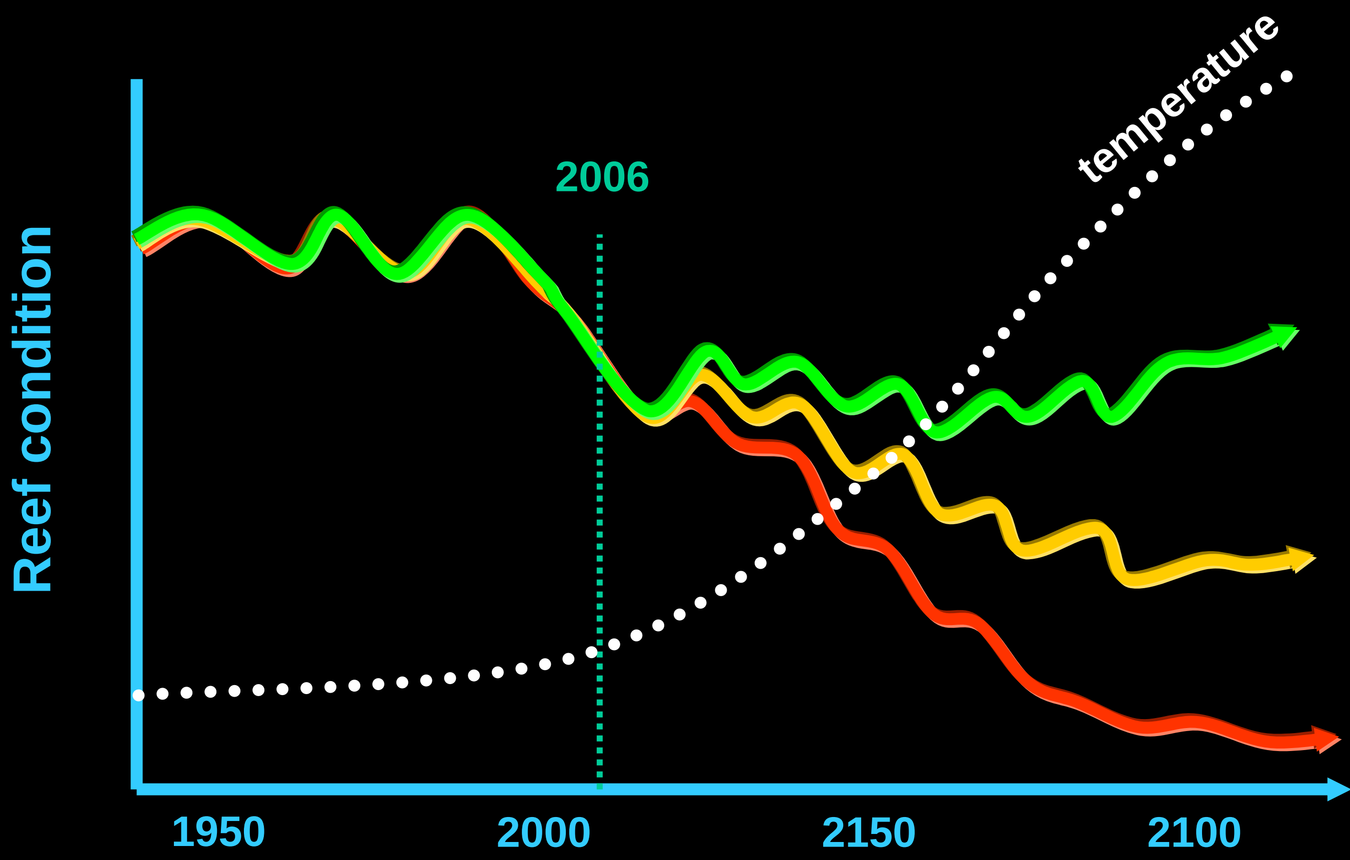
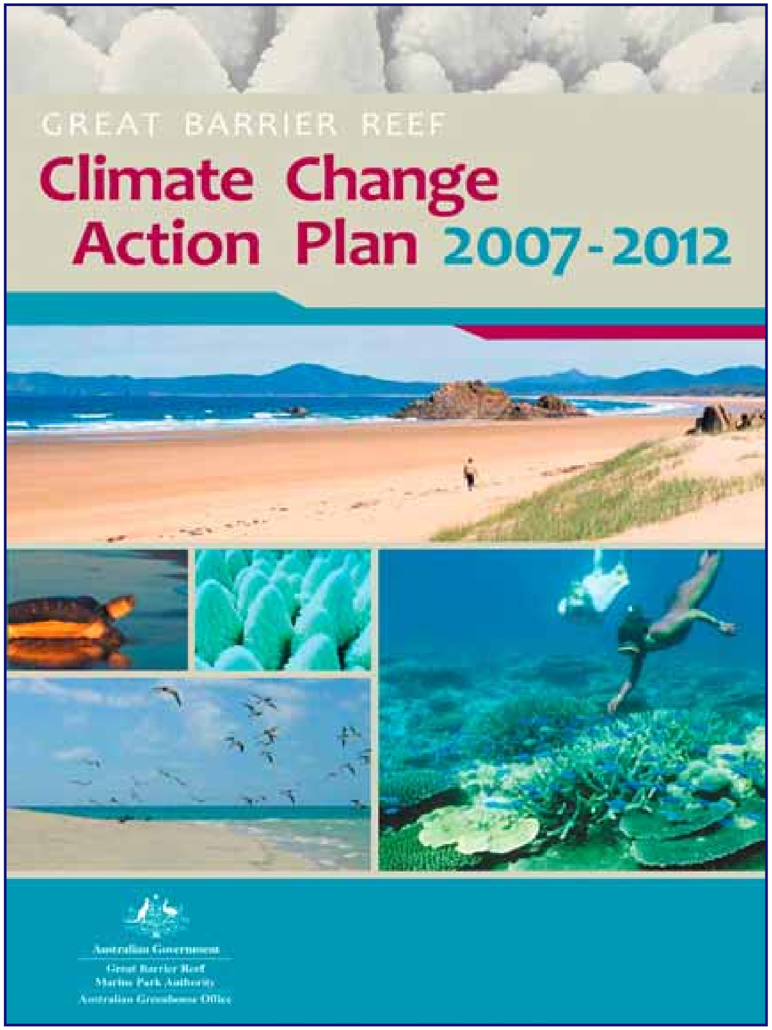


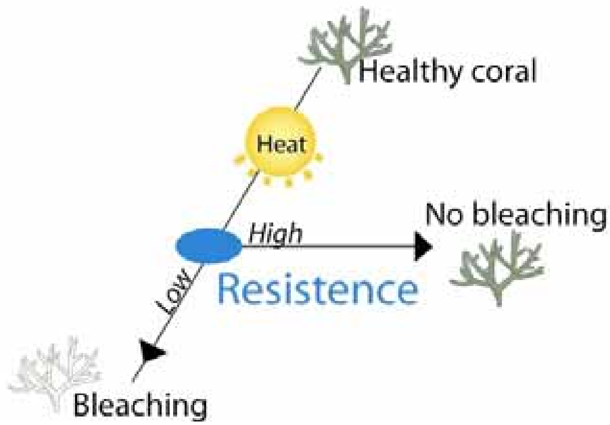
Building resilience



Goal

To maximise the resilience of the Great Barrier Reef, including dependent industries and regional communities, to climate change

How do we build resilience?



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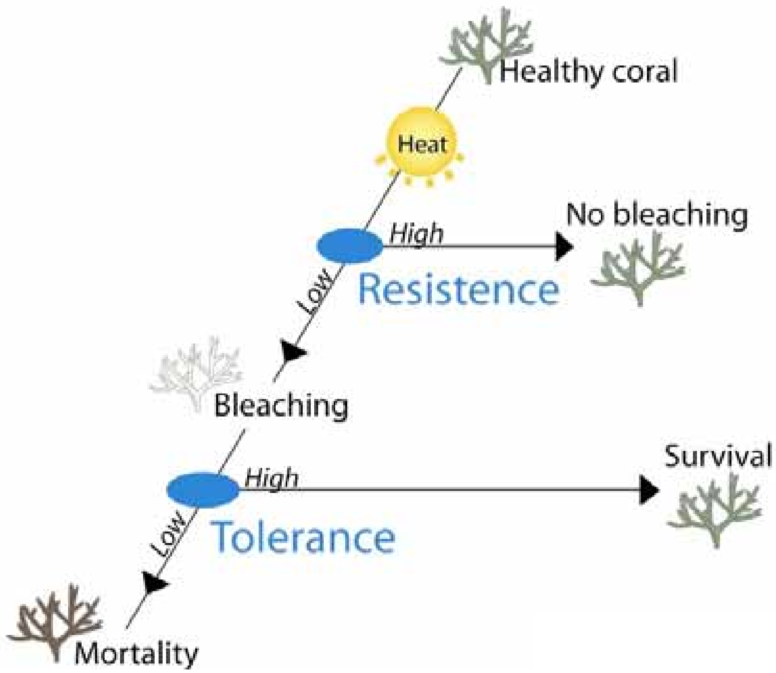

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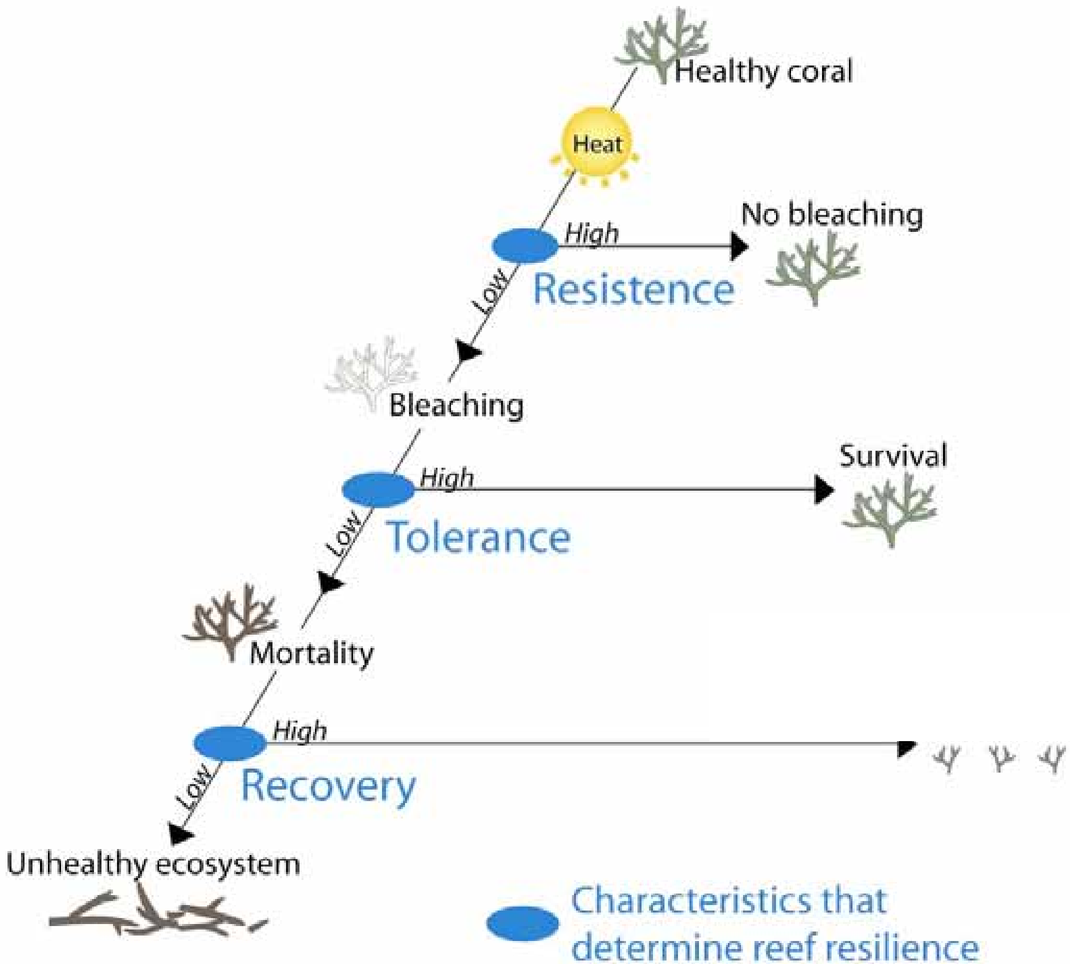

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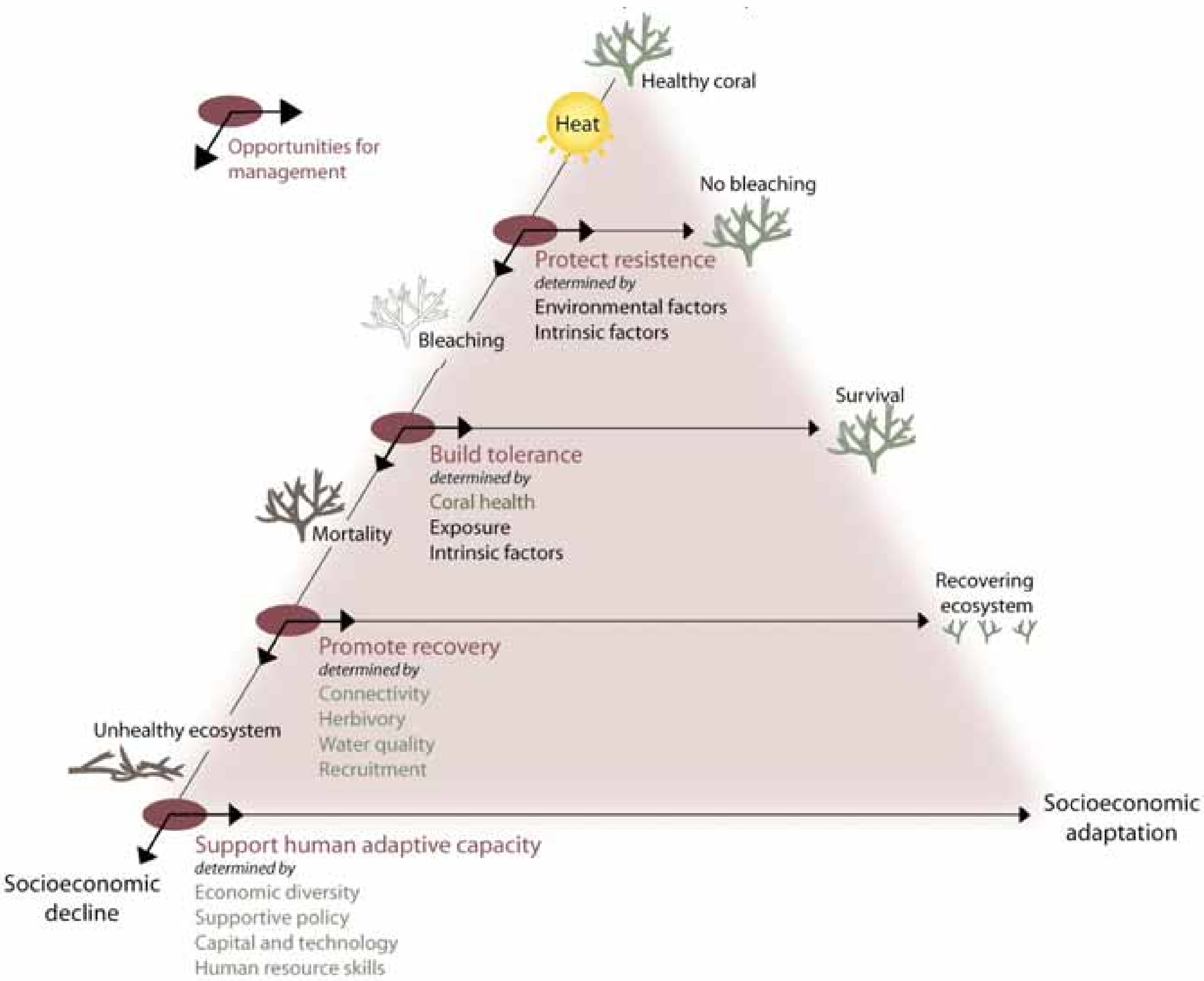
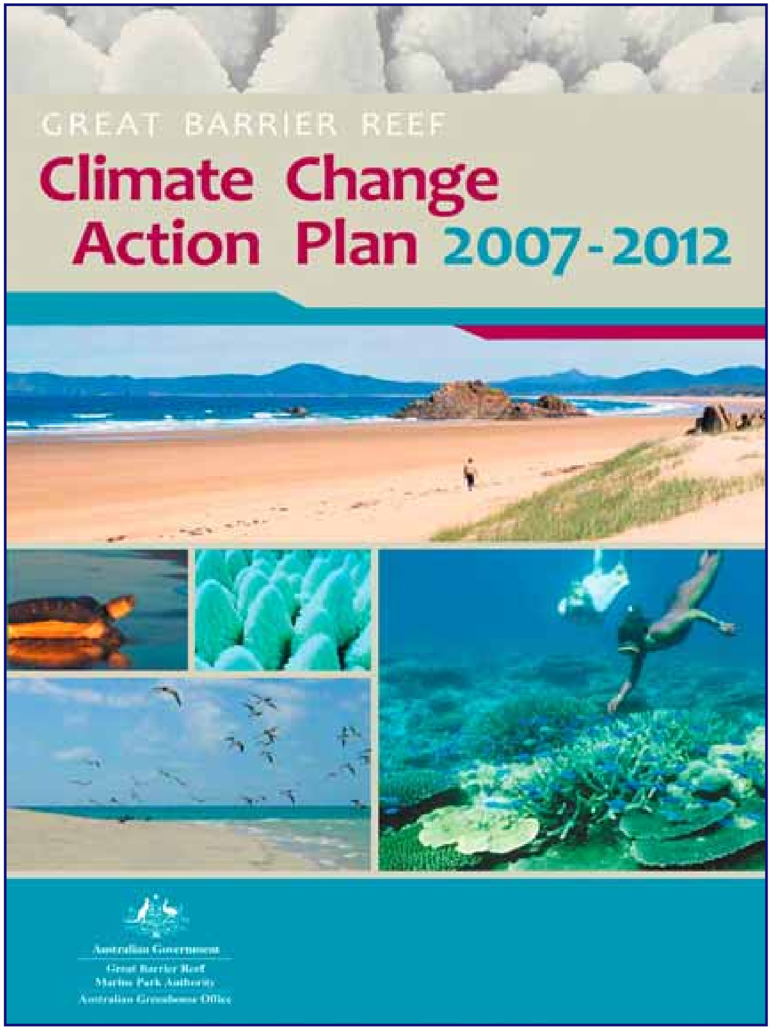


Building resilience in the Great Barrier Reef



Strategies

- Improve management
- Sectoral adaptation plans
- Climate footprints
- Targeted science
- Effective communications

Improving management

- Identifying & protecting refugia
- Policy review
- Interacting stresses
- Reef Resilience Atlas
- Focal sites

Sectoral adaptation plans

GBR tourism:

- Tourism Leader's Forum
- Climate Change Action Group
- Climate Change Adaptation Strategy

GBR fisheries:

- Fisheries Leader's Forum
- Climate Change risk assessment

Reducing climate footprints

Climate friendly tourism operations

GBRMPA - climate neutral business

Reefs as poster child for climate change

Targeting science

Vulnerability Assessment

Research investment strategy

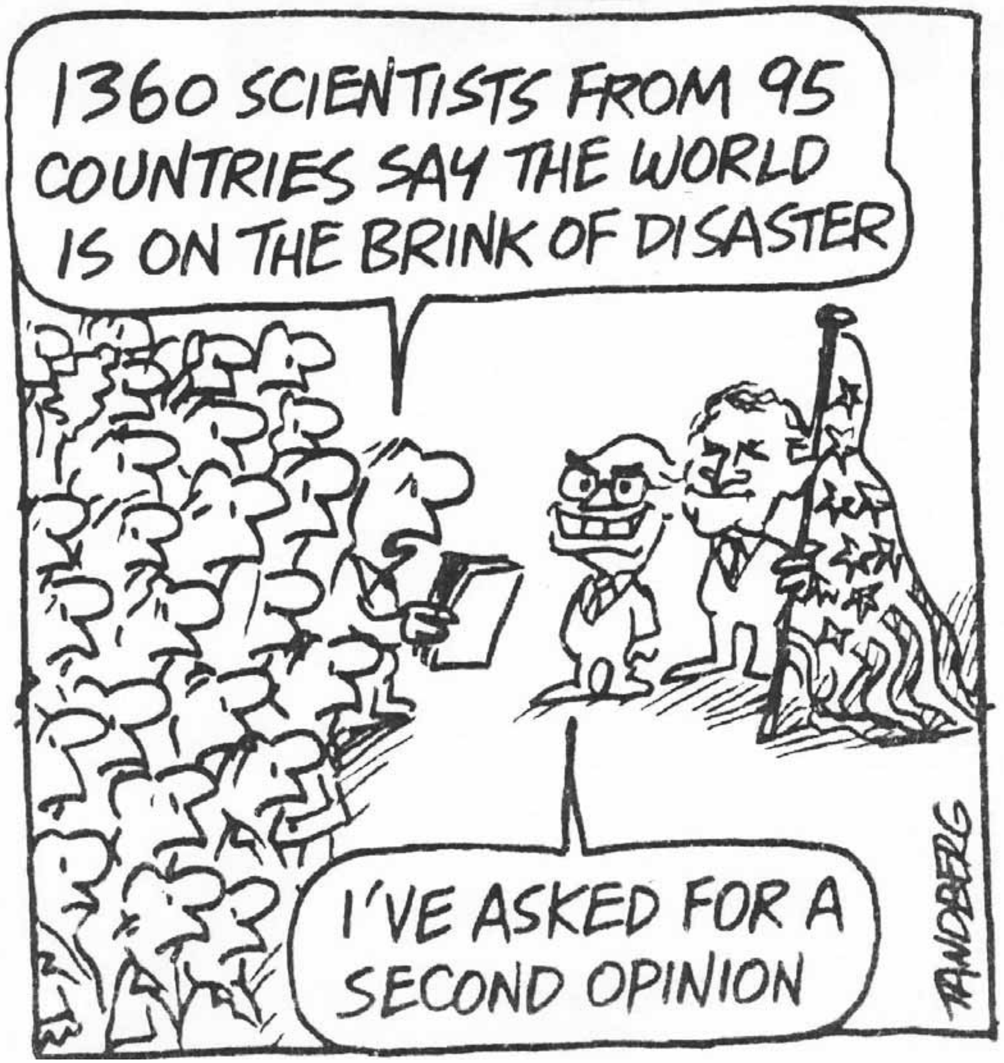
Optimising decisions under uncertainty

Thresholds & irreversible change

Measuring resilience

Matching science to management

Effective communications



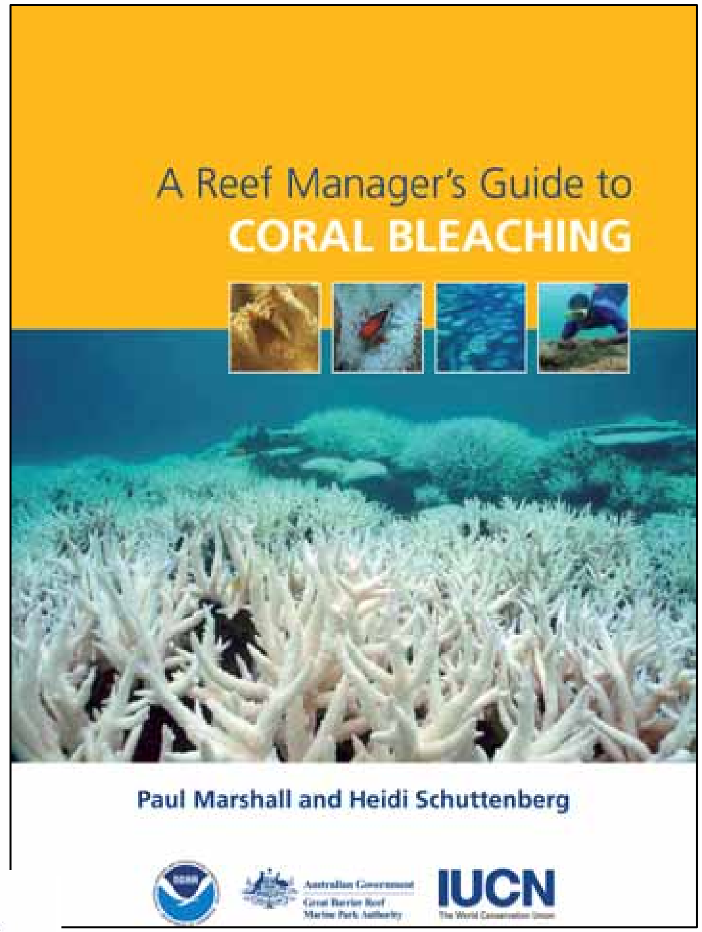
Building capacity

Management workshops

Responding to bleaching events

Building long-term resilience

Adapting management



Climate change adaptation - Focal Sites

Ecosystem resilience
Tourism adaptation
Reduced climate footprints
Communication
Demonstration

Building resilience in the Keppel Islands

Issues

Major tourism & recreation
Important fisheries
Severe bleaching impacts

Response

Protecting refugia
Resilience mapping
Resilience-based management interventions
Reducing pollution
Community involvement

March 2006

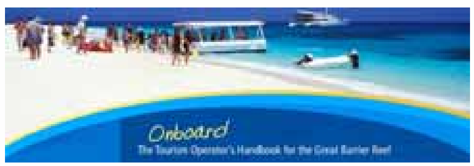
June 2006

Partnerships are essential

Queensland Government

Australian Government
Department of Climate Change

Florida Reef Resilience Program



IUCN

reef resilience r2

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

CSIRO

JCU

The University Of Queensland

AIMS
Australian Institute of Marine Science

WWF for a living planet®

Take home messages

Climate change affects entire ecosystem

Coral reefs committed to further degradation

….but the coral reef crisis can be averted

The (political) climate is changing

Coral reefs are a rallying point

our great barrier reef
let's keep it great