LONG-TERM OUTLOOK

CHAPTER NINE

"We must ... keep hope for the future alive. There may come a time during this century when most reefs the world over will look like the worst of them do today – so degraded that people who remember what a healthy reef looks like might come to feel that reefs are no longer worth bothering with. Whatever the future holds, we must never entertain such thoughts about the greatest marine World Heritage region on Earth."

J.E.N. Veron, 2008
Leading reef scientist and author

"an assessment of the long-term outlook for the ecosystem..." within the Great Barrier Reef Region, Section 54(3)(h) of the *Great Barrier Reef Marine Park Act 1975*

9 LONG-TERM OUTLOOK

9.1 Background

The Great Barrier Reef contains 10 per cent of all the world's coral reefs and is internationally recognised as a World Heritage Area. It is comparatively healthier than most coral reef ecosystems around the world. However, the condition of the Great Barrier Reef has declined significantly compared to its condition prior to European settlement and, as a result, the overall resilience of the ecosystem has been reduced, in turn reducing its ability to recover from future disturbances.

Predicting a long-term outlook for the Great Barrier Reef ecosystem is a difficult and complex task. In developing this outlook, consideration has been given to the current state and trends of the Great Barrier Reef's environmental, economic and social values (Chapters 2, 3 and 4), the factors affecting those values (Chapter 5), the effectiveness of protection and management measures (Chapter 6), the resultant resilience of the ecosystem (Chapter 7) and, finally, the risks the ecosystem is facing (Chapter 8). While no future developments in the management of the threats to the ecosystem have been anticipated, relevant management initiatives that have been identified but not yet fully implemented are taken into consideration.

9.2 Likely trends in key factors

Factors external to the Great Barrier Reef are playing an increasing role in determining its future condition. Climate change, coastal development and catchment runoff are three key factors affecting the long-term outlook for the Great Barrier Reef ecosystem. These factors operate at large geographic scales (globally for climate change) and are socially, biophysically and jurisdictionally complex. Direct extractive use, such as fishing and traditional use, which is more localised, is also a key factor in the future of the ecosystem. The future of the Great Barrier Reef will be largely determined by the cumulative and collective impacts of and trends in these four factors, as well as the management responses to these trends.

9.2.1 Climate change

Coral reefs are one of the world's ecosystems that are most vulnerable to climate change[1], and the Great Barrier Reef is no exception. Climate change factors are likely to have the greatest influence on the long-term outlook for the Great Barrier Reef. It is predicted that the progress of degradation will not be linear, rather ecological responses to climate change will likely occur in a series of abrupt steps separated by intervals of relatively minor change.

Specific climate change threats that present a high risk to the Great Barrier Reef ecosystem are:

- **Increasing sea temperature** As sea temperatures increase, the Great Barrier Reef is becoming increasingly exposed to the possibility of a catastrophic mass bleaching event. In the last century, the average sea surface temperature of the Great Barrier Reef has increased by 0.4°C. Rising global temperatures mean that unusually warm local weather conditions are much more likely to increase water temperatures above bleaching thresholds.
- **Increasing ocean acidification** In the last century, the pH of the ocean has decreased by 0.1 units (i.e. become more acidic). Recent studies on the Great Barrier Reef suggest that coral growth is already being affected.[2]
- **Rising sea level** The sea level in the Great Barrier Reef Region has already risen by about 3mm annually since 1991. Sea level rise is a threat to islands and cays that are important for nesting seabirds and marine turtles. It is also important in the context of coastal infrastructure and low lying urban centres.

Prediction for the Great Barrier Reef

'If atmospheric carbon dioxide levels stabilise at 420ppm and the sea temperatures of the Great Barrier Reef increase by 0.55°C, mass bleaching events will be twice as common as they are at present.

If atmospheric carbon dioxide concentrations increase beyond 450ppm, together with a global temperature rise of 1°C, a major decline in reef-building corals is expected. Under these conditions, reef-building corals would be unable to keep pace with the rate of physical and biological erosion, and coral reefs would slowly shift towards non-carbonate reef ecosystems. Reef ecosystems at this point would resemble a mixed assemblage of fleshy seaweed, soft corals and other non-calcifying organisms, with reef-building corals being much less abundant, even rare. As a result, the three-dimensional structure of coral reefs would slowly crumble and disappear.

Depending on the influence of other factors such as the intensity of storms, this process may happen either slowly or rapidly…

A carbon dioxide concentration of 500ppm or beyond, and likely associated temperature change, would be catastrophic for the majority of coral reefs across the planet. Under these conditions the three-dimensional structure of the Great Barrier Reef would be expected to deteriorate and would no longer be dominated by corals or many of the organisms that we recognise today.'

Garnaut Climate Change Review, 2008[3]

9.2.2 Catchment runoff

The Great Barrier Reef, especially much of its inshore area, is being affected by increased sediments, nutrients and pesticides in catchment runoff mainly from diffuse agricultural sources. With recent advances in agricultural practices and additional government programs, there has been a reduction in sediment and nutrient inputs into some coastal river systems, but a long lag time is expected before there are positive effects on marine water quality.

The effects of degraded water quality on the Great Barrier Reef include the reduction of hard coral cover at some inshore reefs; the increase of diseases and crown-of-thorns starfish outbreaks; the incorporation of pesticides into tissues of invertebrates, marine turtles and marine mammals; and a reduced ability for coral reefs to recover from bleaching or crown-of-thorns starfish outbreaks. Recent flooding from the Great Barrier Reef catchment has resulted in elevated nutrient concentrations in river plumes reaching mid-shelf reefs.

Scientific consensus on water quality in the Great Barrier Reef (GBR)

An analysis of the latest available evidence concludes:

'1. Water discharged from rivers to the GBR continues to be of poor quality in many locations.
2. Land derived contaminants, including suspended sediments, nutrients and pesticides are present in the GBR at concentrations likely to cause environmental harm.
3. There is strengthened evidence of the causal relationship between water quality and coastal and marine ecosystem health.
4. The health of freshwater ecosystems is impaired by agricultural land use, hydrological change, riparian degradation and weed infestation.
5. Current management interventions are not effectively solving the problem.
6. Climate change and major land use change will have confounding influences on GBR health.
7. Effective science coordination to collate, synthesise and integrate disparate knowledge across disciplines is urgently needed.'

Scientific consensus on water quality in the Great Barrier Reef, 2008[4]

9.2.3 Coastal development

Coastal development, primarily driven by rural land use, mining and industry, population growth, urban infrastructure and port development, significantly affects the Great Barrier Reef. The highest risk threats associated with coastal development are clearing or modifying wetlands, mangroves and other coastal habitats and litter, such as plastic bags, washing out to sea and being ingested by species of conservation concern.

A main factor driving habitat loss is the increasing human population in the Great Barrier Reef catchments. Current projections estimate that a human population of nearly 1.5 million people will reside in the Great Barrier Reef catchment by 2026, a 40 per cent increase from the current population. Without adequate planning and careful environmental management, this growth could increase pollution and sedimentation, decrease water quality and change the natural drainage channels. The growth in human population is likely to substantially increase use of the Great Barrier Reef, particularly in areas close to population centres.

9.2.4 Direct use - extractive

The aspects of extractive use highlighted as being of highest risk to the Great Barrier Reef ecosystem relate to altered ecological processes contributing to ecosystem health. Fishing in the Great Barrier Reef targets mainly predators and particle feeders. Unless carefully managed at sustainable levels, the extraction of top predators can affect the ecological balance within the food web.

The lack of information about some target species, the fate of non-retained catch and the incidental catch of species of conservation concern means that the ecosystem level impacts of fishing are not well understood. Progress towards application of best practice management across all fisheries is being made, but not rapidly. For example, the compulsory use of turtle excluder devices in prawn trawl nets seems to have helped stop the decline of loggerhead turtles.

Illegal fishing pressure, by foreign or domestic fishers, can work against management arrangements to protect the ecosystem. Changes in global fisheries production patterns are likely to increase demand for wild caught seafood. On the Great Barrier Reef, the changes are likely to drive a diversification in the species targeted and the areas fished (including remote and deeper water) and increase the likelihood of illegal fishing.

Many Traditional Owner groups along the urban coast have recognised the decline in dugongs in that area and have voluntarily suspended their cultural harvest of this species. However, the lack of information about the levels of traditional hunting of threatened species like dugongs and green turtles creates uncertainty about the sustainability of the activity. In addition, many Traditional Owners have expressed concern about the illegal harvest (poaching) of these species in their sea country by non-Traditional Owners. As with most illegal activities, quantifying the numbers of threatened species which are illegally hunted is difficult.

Lower risk extractive activities, such as the targeting of lower order predators (e.g. coral trout), filter feeders (e.g. scallops) and detritivores (e.g. prawns and sea cucumbers) and the physical impacts of fishing continue to pose some threats to the ecosystem; however for the most part, the current management arrangements for those activities appear to be effective.

9.2.5 Direct use – non-extractive

Direct use of the Great Barrier Reef Region that is non-extractive (such as commercial marine tourism, shipping, some scientific research and recreation not including fishing) poses some threats to the ecosystem but none are considered to be high or very high risk. However, increasing regional populations and economic development may mean an increase in use of the Region, especially from recreation and shipping, and therefore the potential for greater impact to the ecosystem.

9.3 Current initiatives to improve resilience

The Great Barrier Reef Marine Park is considered by many around the world as a leading example of world's best practice management.[5 6 7] Building on these existing arrangements, several major management initiatives are underway to further address the key threats to the Great Barrier Reef ecosystem. These actions and the degree to which they are effectively implemented will strongly influence the Great Barrier Reef's resilience in the future.

Zoning Considered the most significant recent action taken to enhance biodiversity protection[8 9], the *Great Barrier Reef Marine Park Zoning Plan 2003* is having a positive influence on the ecosystem's biodiversity. However it only addresses ecosystem protection at a broad level. The continued effectiveness of the Zoning Plan relies in part on the continued enforcement of zoning arrangements and ensuring reef users are aware of the Plan and its provisions.

Reef Plan Introduced in 2003, the *Reef Water Quality Protection Plan* (Reef Plan) is a joint Australian and Queensland Government plan that aims to halt and reverse the decline in water quality entering the Great Barrier Reef by 2013. It is currently being updated and is supported by a range of initiatives, including the Australian Government's $200 million *Reef Rescue* initiative under the Caring for our Country Program, as well as proposed new Queensland Government regulations that will phase out unacceptable land practices in high risk Great Barrier Reef catchments. Effective implementation of actions under Reef Plan will contribute to improvement in water quality; however, these improvements are likely to take many years to be translated into measurable changes in ecosystem function.

Coastal planning and development To ensure that Queensland's system for planning and development is responsive to its rapidly changing needs, the Queensland Government has implemented a planning reform initiative *Planning for a Prosperous Queensland - A reform agenda for planning and development in the Smart State*. The reform is the culmination of an extensive review of planning and development in Queensland, including the *Integrated Planning Act 1997* and the Integrated Development Assessment System. The Act provides a framework for coordinating and integrating planning at the regional level with the aim of ecological sustainability. A critical part of the reform will be new and improved planning legislation planned to become operational in 2009.

Regional planning plays a key role in helping Queensland communities meet the challenges associated with rapid economic growth, population change and the increasing demand for public services at a local level. In late 2006, the Queensland Government commenced implementing a strategy to accelerate regional planning in regional and rural Queensland, following a three point plan:

- developing and implementing a consistent and contemporary framework for effective regional planning across Queensland
- accelerating implementation of the existing regional plans
- delivering regional plans in rural Queensland.

The vast majority of Queensland's populated coast will have commenced statutory regional planning processes through the accelerated regional planning program in 2009. The *Far North Queensland Regional Plan 2009-2031* was launched in early 2009 and is the over-arching plan for that region.

East Coast Inshore Finfish Fishery In 2008, the Queensland Government committed to implementing revised management arrangements for the East Coast Inshore Finfish Fishery. Recreational fishing measures were established to better manage the potential increasing fishing pressure resulting from population growth in coastal Queensland. This population growth has already resulted in an increase in the number of boats owned in the Great Barrier Reef catchment, which, combined with improvements in fishing technology, may put greater pressure on fisheries resources. The management arrangements also focus on the commercial large mesh (gill) net fishery. Proposed measures include a cap on the amount of shark that can be retained and changes to the way netting operates in order to reduce the incidental capture of species of conservation concern (e.g. speartooth sharks and dugongs).

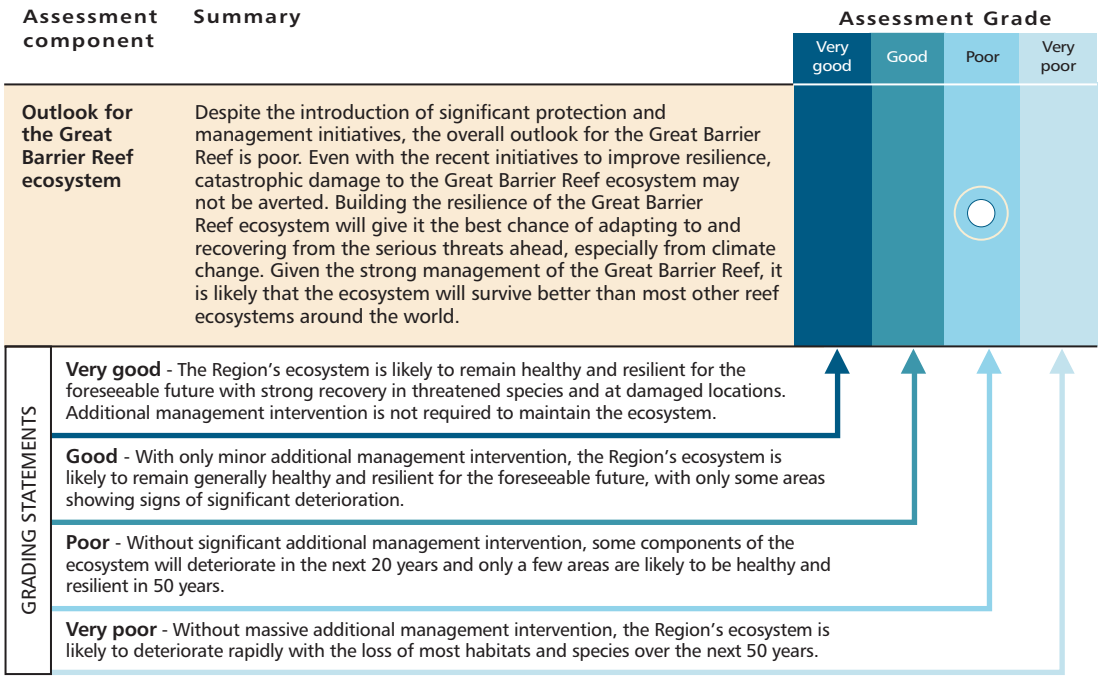
Indigenous partnerships As part of the *Reef Rescue Plan*, $10 million has been allocated to the development of land and sea country Indigenous partnerships. This program aims to strengthen communications between local communities, managers and stakeholders; build a better understanding of Traditional Owner issues relating to the management of the Great Barrier Reef; and improve the sustainability of the traditional use of marine resources, especially where it is focused on species of conservation concern.

Climate change actions The focus of the *Great Barrier Reef Climate Change Action Plan, 2007-2012* is to increase knowledge about the implications of climate change for both the Great Barrier Reef and the people who depend upon it, and to develop and support strategies to foster adaptation and minimise impacts through improving and maintaining resilience. The Action Plan includes an objective to reduce climate footprints, particularly at a local level. It does not include any global mitigation actions. Other dedicated climate change programs are being implemented throughout the Great Barrier Reef Region and beyond by the Australian and Queensland Governments.

9.4 Assessment summary – Long-term outlook

Section 54(3)(h) of the *Great Barrier Reef Marine Park Act 1975* requires *"…an assessment of the long-term outlook for the ecosystem…"* within the Great Barrier Reef Region. This assessment is the culmination of all the previous assessments, particularly the assessments of current ecosystem resilience and the risks to the ecosystem.

9.4.1 Outlook for the Great Barrier Reef ecosystem



9.4.2 Overall summary for long-term outlook

The outlook for the Great Barrier Reef ecosystem, along with most other coral reef ecosystems, is at a crossroad, and it is decisions made in the next few years that are likely to determine its long-term future. Unavoidably, future predictions of climate change dominate most aspects of the Great Barrier Reef's outlook over the next few decades. The extent and persistence of the damage will depend to a large degree on the extent to which climate change is addressed worldwide and on the resilience of the ecosystem in the immediate future.

Many ecosystem components are already showing some effects from climate change (for example increased frequency and severity of coral bleaching and decreased density of coral structures).

It is only with atmospheric concentrations of carbon dioxide between current levels and about 400ppm that the key groups of species and habitats of the Great Barrier Reef have low or moderate vulnerability to climate change. If the atmospheric concentration of carbon dioxide increases beyond these levels then there will be serious consequences for the Great Barrier Reef. At a concentration of 500ppm, it is predicted that many components of

the Great Barrier Reef ecosystem would be highly vulnerable, including seabirds, fish, marine reptiles and plankton. At about this concentration of carbon dioxide, hard corals would likely become functionally extinct and coral reefs would be eroding rapidly.

Much is being done to reduce the local and regional pressures on the Great Barrier Reef and therefore improve its resilience, for example improvements in land management practices and careful management of use of the Region. Management initiatives that further improve the resilience of the Great Barrier Reef ecosystem will mean that the ecosystem is better able to cope with and recover from the impacts of climate change in coming years. This resilience will depend in large part on how effectively the risks of coastal development, catchment runoff and some extractive use are addressed into the future.

Variations in ecosystem response to the threats will occur along the length and width of the Great Barrier Reef. Such regional differences are now observable and are likely to become more obvious over time. Generally, the areas at most significant risk are those closest to already developed areas that have already deteriorated more because of catchment runoff and coastal development. For some of the threats related to climate change, southern areas of the Great Barrier Reef Region, especially inshore, are predicted to be the most vulnerable.

Ultimately, if changes to the world's climate become too severe, no management actions will be able to climate-proof the Great Barrier Reef ecosystem.

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As descendants, we have a lifelong spiritual and physical connection to the land and sea - every living thing is connected through the circle of life. We have a lifelong responsibility to our ancestors to care for land and sea country.

Woppaburra Aspirational Statement
as part of the Woppaburra Traditional Use of Marine Resource Agreement