



# STATUS OF CORAL REEFS OF THE PACIFIC AND OUTLOOK: 2011

ANDREW CHIN, THIERRY LISON DE LOMA, KATIE REYSTAR, SERGE PLANES, KARIN GERHARDT, ERIC CLUA, LAURETTA BURKE, CLIVE WILKINSON



## Acknowledgements

This report is based on the information collected by hard working scientists, managers, conservation organisations and non-governmental organisations working tirelessly across the Pacific. We owe a debt of gratitude to those people who have collected information about coral reefs, their use and management. This project has also benefited greatly from the efforts of those who have collected, managed and synthesised a huge range of information so that we could locate and retrieve this information. We say “thank you” to the authors of the previous synthesis reports and risk assessments, and also to the custodians of this knowledge in libraries and data systems such as ReefBase Pacific and the Pacific Environmental Information Network.

We wish to thank the following organisations which have contributed funds so that this report could be produced and distributed free-of-charge to developing countries around the world: US Department of State; National Oceanographic and Atmospheric Administration of USA; French contributors; the Japanese Ministry of the Environment. The U.S. Department of the Interior, Office of Insular Affairs provided support to the World Resources Institute to prepare materials for this report.

We also extend our thanks to all the reviewers from across the Pacific who gave up their time to ‘ground truth’ this report. Thanks to Tim Adams, Maria Berger, Tim Clark, Monte Depaune, Doug Fenner, Jeremy Goldberg, Yimnang Golbuu, Bob Halstead, Marion Henry, Cherie Morris, Nicolas Pascal, Kelvin Passfield and Helen Sykes. Special thanks go to Chiara Pisapa for her assistance in pulling information together during the final stages of the project. We gratefully acknowledge Jaclyn Davies for preparing the early drafts of the Hawaiian Islands chapter, which included input from Ivor Williams, Jill Zimzow and Bob Shroeder. We thank staff of the Great Barrier Reef Marine Park Authority for their advice in developing this report, and acknowledge the Great Barrier Reef Outlook Report 2009 as an excellent model and approach for future efforts to synthesis knowledge and assess the risks facing coral reef ecosystems. We eventually thank Carole Manry, Enelio Liufau and Atoloto Malau from the ‘Service de l’Environnement de Wallis et Futuna’ for their central contribution to the Wallis and Futuna chapter.

We dedicate this report to the Peoples of the Pacific who are facing existing and increasing challenges on numerous fronts. It is our hope that this report will help to drive action that makes a real difference in the health and well being of the Pacific community, and in ensuring the protection and wise-use of their coral reefs and resources.

## GCRMN Management Group

IOC-UNESCO – Intergovernmental Oceanographic Commission of UNESCO

UNEP – United Nations Environment Programme

IUCN – International Union for Conservation of Nature (Chair)

The World Bank, Environment Department

CBD – Convention on Biological Diversity

GBRMPA – Great Barrier Reef Marine Park Authority

WorldFish Center and ReefBase

ICRI Secretariat – Governments of France, Samoa and Monaco

RRRC – Reef and Rainforest Research Centre, Ltd (Australia) as host

GCRMN Major Supporters and Operational Partners

US Department of State and NOAA – National Oceanic and Atmospheric Administration of USA

National Fish and Wildlife Foundation of USA

GCRMN SocMon (Socioeconomic Monitoring Initiative for Coastal Management) at NOAA

Reef Check Foundation, Los Angeles

ReefBase and WorldFish Center, Penang

CRISP - Coral Reef Initiatives for the Pacific,

World Resources Institute, Washington DC

Note: The conclusions and recommendations of this book are solely the opinions of the authors, contributors and editors and do not constitute a statement of policy, decision, or position on behalf of the participating organisations, including those represented on the cover.

Photographs on the Front and Back Cover are explained and credited inside the back cover.

**Citation:** Chin, A., Lison De Loma, T., Reynter, K., Planes, S., Gerhardt, K., Clua, E., and Burke, L., Wilkinson, C. (2011). Status of Coral Reefs of the Pacific and Outlook: 2011. Publishers Global Coral Reef Monitoring Network. 260 P.

ISBN 0 642 322228 7

© Global Coral Reef Monitoring Network

[www.gcrmn.org](http://www.gcrmn.org)

Authors [see on the back page]

# FOREWORD FOR THE PACIFIC REPORT

Many of us were introduced to the coral reefs of the Pacific through the books and films of that famous French diver, Jacques Yves Cousteau. He was able to bring the beauty and pristine nature of Pacific coral reefs to people around the world.

Since the time of Captain Cousteau, however, large areas of the world's coral reefs have declined due to the many pressures put on them by global changes and human activities. Reefs have been damaged by destructive fishing practices, terrestrial and marine pollution, siltation from land clearing, poor agricultural practices, urban development, and, more recently, as a result of global climate change, which is causing ocean warming and increasing acidification. It has been estimated by the Global Coral Reef Monitoring Network that the world has effectively lost 19% of productive reef area, with another 15% under immediate threat of loss. This means that millions of people are being deprived of the goods and services provided by coral reefs, such as food from fish, molluscs and algae, tourism benefits and shoreline protection.

Fortunately, recent studies have found that the reefs of the Pacific are faring better than reefs in other parts of the world – almost 52% of Pacific reefs were recently assessed as being at “low risk”; however, for the other 48%, there is no room for complacency. This means that the Pacific holds a wealth of healthy reefs that must be maintained for the peoples of the Pacific and for the world.

Throughout the Pacific, there are literally thousands of islands that range from large mountains surrounded by fringing coral reefs to tiny coral atolls that are all that remains of collapsed volcanoes. Reefs are critically important to Pacific peoples and form an integral part of their livelihood and cultures. People living on small coral islands have developed rich cultural traditions to conserve the resources of their reefs for future use. For example, many communities declare part of their reef as temporary no-take areas (tabu or tambu or ra'ui) to guarantee larger fish catches for special feasts. We now recognise the value of this traditional knowledge and it is essential to include the best aspects into management methods.

In 2010 and 2011, the Governments of France and Samoa, in conjunction with Monaco, chaired the International Coral Reef Initiative. ICRI was launched in 1994 as the only global entity devoted solely to coral reefs. Its aim is to preserve coral reefs and related ecosystems by implementing Chapter 17 of Agenda 21 of the United Nations Convention on the Law of the Sea, and other relevant international conventions and agreements. At the same time, the Global Coral Reef Monitoring Network (GCRMN) was established as an operating network of ICRI, which assists in the development of coral reef monitoring and data management, with equal emphasis on ecological and socio-economic information, and compiles reports on the global status of coral reefs worldwide.

For the last decade, our governments have been very concerned about the health of coral reef ecosystems. In that regard, France, in 1999, launched the French Coral Reef Initiative, and have funded several regional programs, including the very successful Coral Reef Initiatives for the Pacific (CRISP). In Samoa, one of the most advanced Pacific small island States in coastal management, traditional culture and management methods are still alive for the benefits of its people and environment. For the past 2 years, France and Samoa have highlighted the threats to the ocean environment, including ocean acidification, pollution, and illegal and destructive fishing.

We also have urged the international community to work towards better management of coral reefs and related ecosystems, and have been pushing to bring the Ocean back into the next UN Earth Summit at Rio+20. Indeed Rio+20 is the opportunity to effectively tackle the international governance of the world's oceans and, in the context of sustainable development, recognize and address the possibilities of a "blue economy", which is vital for so many island and coastal States. We were also very successful in having ICRI recognized in the United Nations Report of the Secretary-General entitled "*Protection of coral reefs for sustainable livelihoods and development*" as the only global entity devoted solely to coral reef conservation.

We are very pleased to endorse this report, which provides the first comprehensive assessment on the status of all coral reefs throughout the Pacific, but particularly to emphasise the current management capacity and the outlook of these reefs in the face of increasing local pressures and climate change.

Perina SILA  
Deputy CEO  
Ministry of Foreign Affairs  
Samoa

Jean-Pierre THÉBAULT  
Ambassadeur délégué à l'Environnement  
France

# CONTENTS

Executive Summary . . . . .	1
Introduction . . . . .	23
I. Country reports SouthWest Pacific (Melanesia), Micronesia, Polynesia Mana . . . . .	32
SouthWest Pacific . . . . .	33
Fiji . . . . .	33
Nauru . . . . .	42
New Caledonia . . . . .	48
Papua New Guinea . . . . .	56
Solomon Islands . . . . .	65
Tuvalu . . . . .	74
Vanuatu . . . . .	80
Micronesia . . . . .	90
Commonwealth of the Northern Mariana Islands . . . . .	90
Federates States of Micronesia . . . . .	100
Guam . . . . .	108
Palau . . . . .	118
Republic of the Marshall Islands . . . . .	128
Polynesia Mana . . . . .	137
American Samoa . . . . .	137
Cook Islands . . . . .	146
French Polynesia . . . . .	154
Republic of Kiribati . . . . .	165
Niue . . . . .	175
Samoa . . . . .	181
Tokelau . . . . .	190
Tonga . . . . .	197
Wallis and Futuna . . . . .	206
Hawaiian Islands . . . . .	214
II. Information Management in the Pacific . . . . .	224
Australia – Great Barrier Reef . . . . .	224
The SPREP Pacific Environmental Information Network (PEIN) and Information Resource Centre (IRC) . . . . .	226
ReefBase Pacific: a new information system for the Pacific’s coral reefs . . . . .	228
Case studies: Sustainable development of reef resources . . . . .	230
Post-larval capture and culture (PCC) . . . . .	230
Reef Rehabilitation . . . . .	232
Reef sharks in Palau: Business partners or dinner guests? . . . . .	235
Case studies: Management of Coral Reefs . . . . .	238
Locally Managed Marine Areas (LMMAs) in the Pacific . . . . .	238
Integrating LMMAs into policy and legislation . . . . .	240
Tetepare Conservation Area: Solomon Islands . . . . .	241

III. Summary and Conclusions .....243  
Appendix 1 – Details of descriptive themes .....252  
Appendix 2 – Information, agencies and programs .....256

# EXECUTIVE SUMMARY

## Synopsis

- Coral reefs are integral to the cultures and nutrition of many Pacific peoples; this report was developed to assist reef conservation for those peoples;
- Most coral reefs in the Pacific remain generally healthy, with strong potential for recovery of coral, fish and invertebrate populations after damaging events;
- There are, however, many signs of decline, especially on reefs around population centres and in lagoons;
- The main drivers of changes in coral cover at larger scales include major ‘natural’ stresses in storms and cyclones, outbreaks of crown-of-thorns seastars (COTS) and coral bleaching driven by climate change;
- The trends in coral cover vary considerably from country to country. Current reef status is a reflection of recent damaging events, predominantly ‘natural’, and most damaged reefs appear to be recovering. While trends in reefs can be detected for individual countries and territories, no strong Pacific-wide or regional trend is evident;
- At more localised scales, coral reefs are driven by the interactions between many, environmental and human factors. These damaging human factors include: over-exploitation of fishes and invertebrates; sedimentation from poor land-use such as agriculture; mining of coral and sand; urban and tourism developments; and pollution from domestic and farming wastes;
- Fishing and harvesting have definitely affected coral reef communities across the Pacific, especially in close proximity of towns, but the magnitude of these effects varies considerably between countries and islands;
- Traditional management practices, such as permanent or temporary closure of fishing areas or bans on catching some species, remain particularly strong in the Pacific and are a major force for coral reef conservation;
- Many countries and territories have sound legislation to manage coral reef resources, but lack the capacity, logistic resources and sometimes the political will to enforce these laws. However, many countries and territories are making efforts to improve capacity for enforcement and raise awareness of the need for reef conservation; and
- Our conclusions are that **the longer-term outlook for the coral reefs of the Pacific is considered to be Poor due to threats posed by climate change.**

## Summary

The coral reefs of the Pacific are in better condition than those in other reef regions in the world, and remain the less stressed compared to reefs elsewhere. This is encouraging considering that recent global reports paint a gloomy picture of the status (and likely future prospects) of large areas of the world’s coral reefs. However, the longer term outlook for Pacific reefs is

not encouraging with increasing human-induced threats and global climate change predicted to result in considerable damage in coming decades. This constitutes our conclusion, while many of the reefs in the Pacific appear healthy and resilient now, the outlook is poor.

Most Pacific reefs are in reasonable to good condition with either healthy or recovering coral communities and reasonably intact coral reef fish and invertebrate populations. There are large numbers of coral reefs spread over vast areas of the Pacific that are remote from human pressures; these remain among the best preserved reefs in the world. Many of these reefs grow around low lying and uninhabited atolls with few human pressures and no runoff from the land. Recently, there have been active processes to declare many of these reefs as protected areas with considerable success.

In contrast, coral reefs adjacent to larger population centres show clear evidence of over-fishing, pollution from nutrients and sewage, damage from coastal and catchment developments, and increasing damage from land-sourced sediments washing off high volcanic islands. Most of the high islands in the Pacific are steep and recent in origin, such that they contain readily erodible soils. Unsustainable exploitation of forest timbers is a major cause of severe sediment damage to downstream coral reefs.

Human population growth is generally very high in the Pacific, which will result in increasing fishing, pollution and development pressures. There is already clear evidence of damage arising from global climate change with erosion and inundation of shorelines of coral atolls from sea level rise, increasing temperatures resulting in coral bleaching and death, rising ocean acidification reducing coral growth, and predictions for more very damaging tropical cyclones.

This Pacific Status and Outlook report summarises all the readily *available and accessible information* about the coral reef ecosystems of the Pacific. This report has two objectives: provide an overview of the status of coral reefs of Pacific Island Countries and Territories (PICTs) by collating and synthesising recent regional summaries and national reports; and organise and standardise this information to develop a preliminary assessment of the future outlook for coral reefs of the Pacific. The report seeks to identify and describe the main trends and patterns for each of 5 themes: coral reef condition; coral reef health with emphasis on resilience; use of reef resources; factors affecting coral reefs; and governance and management.

In assembling this report, we identified many gaps and uncertainties in the available data and information. These gaps are not uniform throughout the Pacific, as some PICTs have assembled considerable data and information for many of their reefs; however, most PICTs have undertaken limited monitoring and assessment, therefore the level of 'confidence' used to describe each theme is often very low. The low level of information reflects the social, cultural, economic and political circumstances of many PICTs, which have inadequate resources and capacity for effective monitoring and follow-up assessment of management effectiveness.

Some PICTs have conducted long-term monitoring programs that assist in describing trends in coral reef communities, resources and use patterns. Other PICTs have started monitoring recently that will provide a critical baseline to assess trends and patterns in the future. The ongoing problem for reporting on reef status throughout the Pacific is that many of the island groups are scattered across vast stretches of ocean, making monitoring particularly difficult and expensive. This is also a challenge for management to gather fisheries catch and effort data, to enforce fisheries regulations and address illegal and/or unreported fishing, such as fish poaching and shark finning.

This report follows two previous global reports <sup>(1,2)</sup> that had similar findings, in summary:

- **coral reef condition.** The condition of most reefs in the Pacific is stable to healthy, with either good coral growth or recovering communities, and relatively healthy fish and invertebrate populations. The condition of the reefs is usually a direct reflection of recent



major disturbances in the past 2 decades, especially major coral bleaching events, crown-of-thorns seastar (COTS) outbreaks, and major tropical cyclones. There is, however, clear evidence of damage resulting from over-exploitation and pollution on reefs near the major centres of human activity;

- **coral reef health and resilience.** In general, most Pacific reefs retain strong resilience to damage and demonstrate the ability of coral communities and fish populations to recover after major damaging events such as cyclones, coral bleaching and COTS outbreaks. However those reefs adjacent to population centres or major developments have lost much of their resilience and long-term decline in status is evident; these reefs are either not recovering or recovering slowly;
- **use of reef resources.** Pacific peoples are highly dependent on coral reef resources and have amongst the highest per capita consumptions of fisheries products in the world. However this dependence is resulting in over-exploitation near population centres with more people fishing and using more advanced and efficient technology. Destructive fishing practices are also reported from a few locations. The Secretariat for the Pacific Community has calculated that a 46% increase of fish production will be required to meet requirements to feed the growing populations in the next 20 years. The predictions are that Melanesia + Micronesia + Polynesia will require an increase from 245,000 to 369,000 tonnes in the annual supply of fisheries products <sup>(3)</sup>. Coral reefs are also mined for sand and rock for construction which results in localised damage; this is particularly serious in the face of rising sea levels. Tourism is a major use of coral reefs in some locations, and while delivering substantial economic benefits, poorly managed tourism can damage reefs through inappropriate coastal development and recreational overuse;
- **factors affecting coral reefs.** Reefs in the Pacific are threatened by the same stresses that damage reefs elsewhere in the world. The major factors (aside from direct extractive use) include nutrient pollution and eutrophication (from sewage, runoff of fertilizer and livestock waste), sediment pollution from poor land development including deforestation, agriculture and tourism resort construction, urban coastal development and dredging, destructive COTS outbreaks, and the more global threats of climate change resulting in coral bleaching, ocean acidification and increases in storm severity that all damage coral communities. The ameliorating factor in the Pacific is that most reefs are growing on the sides of seamounts in very deep water, such that pollution from the land is usually rapidly dissipated, except where it is retained in coral reef lagoons; and
- **governance and management.** Pacific Island Countries and Territories are acutely aware of the need for effective management of their coral reefs which are vital for their cultures and economies. However, few of these island states have the capacity and logistic resources to effectively manage their coral reefs that are often spread over vast distances. Most PICTs have effective legislation for reef management, but few have the capacity for effective enforcement of the regulations, and in some cases there is inadequate political will to enforce the laws. It is encouraging that most PICTs are increasing their efforts at reef conservation and there has been the recent declaration of very large areas of the Pacific Ocean with no-take protection aimed at conserving the coral reefs. The re-invigoration of community-based and traditional management in some locations is another promising development in managing reefs in the Pacific

The 2011 *Reefs at Risk Revisited* report identified slightly less than 50% of Pacific reefs as being threatened by local activities, of which only 20% are at high or very high threat. Overfishing and destructive fishing is the most widespread threat, followed by watershed-based pollution, coastal development, and marine-based pollution and damage <sup>(1)</sup>. However, 52 % of reefs were rated at a low risk level, which makes it the least threatened region, after Australia. *Reefs at*

*Reefs at Risk Revisited - Integrated Local Threat Results by country (grouped by GCRMN 2011 Nodes in this report)*

Region / Country	Area of Reefs (sq km)	Reefs at Low Threat	Reefs at Medium Threat	Reefs at High Threat	Reefs at Very High Threat	Total Reefs Threatened (Medium or Higher) by Local Threats
<b>Southwest Pacific Summary</b>	<b>38,460</b>	<b>43%</b>	<b>31%</b>	<b>19%</b>	<b>6%</b>	<b>57%</b>
Fiji	6,704	34%	34%	21%	10%	66%
Nauru	15	0%	0%	20%	80%	100%
New Caledonia	7,450	63%	30%	6%	0%	37%
Papua New Guinea	14,535	45%	26%	22%	7%	55%
Solomon Islands	6,743	29%	42%	24%	6%	71%
Tuvalu	1,210	84%	12%	4%	0%	16%
Vanuatu	1,803	8%	37%	41%	14%	92%
<b>Micronesia Summary</b>	<b>9,855</b>	<b>70%</b>	<b>21%</b>	<b>6%</b>	<b>3%</b>	<b>30%</b>
CN Mariana Islands	182	10%	6%	18%	66%	90%
FS Micronesia	4,925	70%	23%	6%	1%	30%
Guam	225	54%	1%	16%	29%	46%
Palau	966	69%	26%	3%	1%	31%
Marshall Islands	3,558	74%	20%	5%	1%	26%
<b>Polynesia Mana Summary</b>	<b>12,588</b>	<b>58%</b>	<b>27%</b>	<b>12%</b>	<b>3%</b>	<b>42%</b>
American Samoa	129	13%	32%	44%	11%	87%
Cook Islands	528	51%	39%	9%	1%	49%
French Polynesia	5,981	76%	15%	7%	2%	24%
Kiribati	3,041	29%	55%	16%	0%	71%
Niue	45	2%	71%	26%	0%	98%
Samoa	402	0%	6%	43%	51%	100%
Tokelau	155	55%	45%	0%	0%	45%
Tonga	1,662	63%	26%	9%	2%	37%
Wallis And Futuna	646	68%	12%	19%	1%	32%
<b>Hawaiian Islands Summary</b>	<b>3,834</b>	<b>83%</b>	<b>3%</b>	<b>6%</b>	<b>9%</b>	<b>17%</b>
<b>TOTAL - PACIFIC REGIONS</b>	<b>64,736</b>	<b>52%</b>	<b>27%</b>	<b>15%</b>	<b>5%</b>	<b>48%</b>
Australia (Pacific Coast)	36,834	86%	13%	1%	<1%	14%
<b>Global Total</b>	<b>249,713</b>	<b>39%</b>	<b>34%</b>	<b>17%</b>	<b>10%</b>	<b>61%</b>

*Table 1a. These estimates of current threats to coral reefs from local pressures illustrate that Pacific reefs (and on the GBR of Australia) are under less pressure from local threats than reefs elsewhere in the world. Global climate change remains the largest single threat to Pacific reefs exceeding these local impacts. Predictions that include climate change effects out to 2030 and 2050 are included in the more detailed country assessments from Reefs at Risk Revisited section in each country chapter (from Reefs at Risk Revisited) <sup>(1)</sup>.*

Status 2008 Regions	Reef Area (km <sup>2</sup> )	Reefs effectively lost	Reefs at critical stage	Reefs at threatened stage	Reefs healthy
Southwest Pacific	27,060	3%	17%	35%	44%
Micronesia	12,700	8%	7%	15%	70%
Polynesia Mana	6,733	3%	2%	5%	90%
Hawaii & islands	1,200	2%	4%	8%	86%
Australia & PNG	62,800	3%	4%	10%	83%
<b>Pacific Total</b>	<b>110,493</b>	<b>4%</b>	<b>7%</b>	<b>16%</b>	<b>72%</b>
<b>World Total</b>	<b>284,803</b>	<b>19%</b>	<b>15%</b>	<b>20%</b>	<b>45%</b>

*Table 1b. These assessments and predictions were assembled using predominantly expert opinion and anecdotal data in Status of Coral Reefs of the World: 2008 <sup>(2)</sup>. While the assessments in Tables 1a and 1b vary in methodology groupings of countries, and the area of reef listed per country, they do illustrate that the Pacific reefs (including all those of Australia) are in a far healthier state than most reefs elsewhere in the world. Global climate change remains the largest single threat to Pacific reefs far exceeding local impacts.*

*Risk Revisited* results, grouped according to the regions used in this report, are presented in Table 1a.

Monitoring assessments combined with anecdotal reports gathered by the Global Coral Reef Monitoring Network listed 11% of reefs as either effectively lost or critically threatened, with 72% of reefs at a healthy stage (BUT excluding the threats of climate change) <sup>(2)</sup>. These assessments (Table 1b) point to the Pacific reefs being amongst the most healthy in the world, but both reports emphasise that this is no reason for complacency <sup>(2)</sup>.

## **Major threats to the coral reefs of the Pacific**

The major threats to the region can be categorised into two major classes:

- larger-scale, mostly global threats, some of which are truly natural and others linked to human activities operating at a global scale; and
- localised stresses that predominantly result from direct human activities.

The major medium to long-term threats are from global climate change. Rising sea surface temperatures inducing coral bleaching and mortality, probable increases in very destructive cyclones/typhoons, and increasing ocean acidification pose threats to all reefs in the Pacific. The specific nature of these threats at the local scale will vary considerably, particularly as most Pacific reefs are surrounded by deep ocean waters that will buffer some of the temperature and acidification rises. But unless the emissions of greenhouse gases decrease markedly, the future prospects for all coral reefs, including those in the Pacific, is bleak. Sea level rise poses a severe threat to low lying coral islands in the Pacific, particularly those sitting on seamounts that are sinking. There is a real threat that nations such as Kiribati, the Marshall Islands, Tokelau and Tuvalu will become uninhabitable in coming decades; they are already suffering significant erosion.

The other major larger scale threat is posed by outbreaks of COTS which have devastated coral communities on many Pacific reefs. Generally, reefs retain a latent capacity to regrow the corals after such devastating coral predation, however reefs under chronic local stress and bleaching damage may have much lower recovery potential.

The major local threats are from over-fishing and destructive fishing; this particularly threatens many reefs near human populations, particularly via the removal of herbivorous fishes. Reef damage is occurring from coastal development for urban infrastructure and tourist resorts, from local pollution by untreated or poorly treated sewage, and from some minor industries such as fish processing and sugar refining industries. Most reefs around high islands and atolls are surrounded by deep water which can rapidly dilute such pollution; whereas pollution is retained in lagoons and over broad reef flats, thereby damaging these reefs. These threats, however, are at a much lower level than in most other parts of the world, especially in nearby East Asia.

Pacific Island countries and territories face increasing pressures and challenges from population growth and globalization that will result in increases in local threats; and most of these will be exacerbated by global climate change. These threats and likely impacts are summarised in the 2005 UNEP/SOPAC Environmental Vulnerability Index <sup>(4)</sup>.

## **Major conservation activities and initiatives**

There have been a series of major conservation initiatives in the region over the past 5 years; the main ones being the:

- Coral Triangle Initiative, which includes Papua New Guinea and the Solomon Islands;

- The parallel 'Pacific Coral Triangle Initiative', which includes Fiji and Vanuatu;
- Micronesia Challenge which was launched by the leaders of Federated States of Micronesia, Guam, Palau, Northern Mariana Islands and the Marshall Islands with a commitment to have 30% of coastal waters and 20% of the land area under active conservation management by 2020;
- World Heritage Listing of the Lagoons of New Caledonia to protect large areas of coastal habitat;
- Man and Biosphere Reserve (UNESCO) Listing of Fakarava in French Polynesia, which includes seven atolls in the Tuamotu archipelago;
- World Heritage Listing project of the Marquesas Islands in French Polynesia;
- Phoenix Islands Protected Area launched by the government of Kiribati with assistance from major NGOs;
- The major extension of protected area status with the designation and World Heritage Listing of the Papahānaumokuākea Marine National Monument covering the Northwest Hawaiian Islands; and
- The Declaration of the Marianas Trench Marine National Monument and the U.S. Pacific Remote Island Areas conserves many remote islands with extensive and healthy coral reefs.
- On 25 November 2011, Australia proposed that about 1 million km<sup>2</sup> of the Coral Sea be granted greater protection under the 'Coral Sea Commonwealth Marine Reserve'. This proposal is open for public consultation.

Unlike elsewhere in the world, the Pacific retains many of the traditional management philosophies and activities. These were developed over hundreds of years to conserve scarce coastal resources, especially coral reef fish and invertebrate stocks. Traditional societies had a system of temporary closures of some of their reef area (called 'tabu', or 'ra'ui/rahui') to increase resources for special feasts. These have been incorporated in a rapidly expanding system of Locally Managed Marine Areas, driven largely by initiatives from Fiji. There is also a strong movement for co-management of coral reefs between communities and government. One particular example is the incorporation of local fisheries reserves into the national legislation in Samoa. Another is the management plan of Moorea's coral reefs (PGEM), voted in the local legislation of French Polynesia, and serving as a model for the management of several other islands (Bora Bora, Tahaa).

## **Recommendations for Action**

- Be part of a global campaign to urgently combat Climate Change by reducing emissions of greenhouse gases;
- Maximise coral reef resilience by reducing overfishing and habitat degradation;
- Address excess population growth and unsustainable resource use;
- Develop national adaptation strategies for the social, cultural and economic impacts of climate change;
- Stop destructive fishing and manage coastal fisheries to ensure sustainable use;
- Improve catchment management to reduce downstream pollution and control damaging coastal development;
- Provide advice on reducing sediment and nutrient pollution in coastal areas;

- Improve sewage treatment and waste management;
- Develop alternative livelihoods to ease pressures on fisheries resources, including aquaculture;
- Develop more MPAs, link them into networks and strengthen enforcement;
- Train people in communities, NGOs and within governments in reef and socioeconomic monitoring and management;
- Support community-based management efforts through training and recognising traditional management methods; and
- Raise awareness of coral reef problems and possible solutions.

These recommendations are presented in more detail in ‘Concluding remarks and recommendations’ section on Page 250.

## **Knowledge gaps**

There was insufficient information for some themes chosen in this ‘outlook’ process to adequately describe trends and patterns with a high level of confidence:

- **Reef health and resilience:** this requires long-term data from several locations over decadal time spans on disturbance and recovery cycles, and reef processes such as coral recruitment, changes in species composition, grazing by herbivores, calcification rates etc. This information is used to understand reef responses to pressures, to provide early warning before catastrophic changes, and to assess management effectiveness, and also for adaptive management;
- **Reef resource use:** trend analyses require long-term data on catch and fishing effort at the species level. Risk assessments, preferably collected over long periods for subsistence and commercial fisheries are especially useful in adaptive management;
- **Factors affecting reef health:** there were anecdotal reports describing damage to coral reefs with indications of worsening trends (e.g. increases in pollution and erosion), but detailed monitoring programs were rarely available to understand how coral reefs respond to management initiatives.
- **Governance and management:** There was little information on the effectiveness of management arrangements, plans, policies, laws and regulations, and little information on implementation. Socioeconomic monitoring of reef users to determine compliance and acceptance of these rules is used to support ‘on-ground’ monitoring of the reefs.

## **Country profiles: Southwest Pacific Node**

The country and territorial profiles are clustered in the Nodes used by the Global Coral Reef Monitoring Network (GCRMN). The 3 main Nodes are **Southwest Pacific Node** which contains predominantly Melanesian islands coordinated out of the University of the South Pacific in Fiji; **Micronesia Node** coordinated through the Palau International Coral Reef Center (PICRC); and **Polynesia Mana Node** coordinated by CRIOBE in Moorea, French Polynesia.

The **Southwest Pacific Node** contains Fiji, Nauru, New Caledonia, Papua New Guinea, Solomon Islands, Tuvalu and Vanuatu. The reefs have high coral diversity (some of these countries/territories are in the Coral Triangle) and are predominantly in good condition with strong recovery capacity after major disturbances from coral bleaching, COTS and cyclones. The larger island archipelagos of Fiji, New Caledonia, Papua New Guinea, Solomon Islands and Vanuatu

have many remote coral reefs with healthy commercial fish and invertebrate populations. Those reefs in close proximity to population centres, show evidence of stress and decline.

**Fiji** has reliable and consistent monitoring data that report reefs in good condition and strong resilience and recovery potential after coral bleaching, COTS outbreaks and cyclones. Human pressures from fishing, sedimentation, pollution from land-based sources, coastal development and population growth are all increasing around the more populated islands. Reef management is largely driven through traditional communities establishing their own MPAs; recent political disturbances have slowed progress.

Little information is available about the small reef area of **Nauru**. There is intensive reef resource use, and phosphate mining has caused localised damage to the reefs. Effective management is needed to ensure sustainable resource use.

Good long-term data from around Noumea in **New Caledonia** show stable reefs that recover from disturbances, although coral recruitment may be naturally low; data are more sparse elsewhere. Reef resources appear stable, but giant clams and sea cucumbers are depleted and sediment runoff and pollution, especially from nickel mining, has damaged some reefs. Management is improving with increases in MPAs and enforcement capacity, and the listing as a World Heritage site will help further improvements.

Vast areas of reefs in **Papua New Guinea** appear to be healthy with strong ability to recover after disturbances. There is some damage from sediments, pollution, and overfishing; harvest pressures are increasing and rapid population growth will further increase pressures. Legislation is strong, but management is limited by low capacity and political will, and poor access to remote reefs.

Only the Western Province of the **Solomon Islands** has been monitored and this shows reefs with high coral cover and relatively low pollution, but exploitation is increasing in some areas. There are growing pressures around the populated islands with deforestation a major threat. Locally Managed Marine Areas and other community efforts are promising management tools.

Occasional monitoring in **Tuvalu** suggests that reefs are stable. There is over-harvesting of fish and invertebrates around the main island, along with pollution and coastal development damage in the lagoon of Funafuti. Sea level rise is causing shoreline erosion. Community-based management appears to be the best mechanism for reef conservation.

Baseline data for **Vanuatu** indicate generally healthy reefs but declines in some harvested stocks, such as sea cucumbers, green snail, triton and some fish stocks. The government and communities have banned some exploitation, often through periodic closures. Community-based management shows positive results, when government enforcement is less effective.

## **Country profiles: Micronesia Node**

This Node, coordinated from the Palau International Coral Reef Center (PICRC) with support from Japan and the USA, supports Commonwealth of the Northern Mariana Islands (CNMI), Federated States of Micronesia (FSM), Guam, Republic of the Marshall Islands (RMI) and Palau. These reefs have high biodiversity as they border the Coral Triangle diversity 'hot spot'. Most reefs are healthy with strong recovery potential following bleaching, COTS outbreaks and major storms. All countries have formed the Micronesia Challenge to protect 30% of their marine territory and 20% of their land, and there has been an increase in monitoring and management activity. Reefs around population centres are being polluted and over-exploited.

Long-term data from the **CNMI** indicate that reefs near more populated southern regions have reduced coral cover, altered species composition and reduced biomass of some reef fishes; whereas reefs in the north are relatively unstressed. Fish catches have declined and water pol-

lution, coastal development and sedimentation have increased around populated islands. Reef management programs are showing positive results.

Most reefs in **FSM** have high coral cover and strong recovery potential, although reefs near population centres (especially Pohnpei) show damage from sedimentation, pollution, coastal development, and growing population pressures. Fish populations have declined and sea cucumber and trochus fisheries have collapsed. Reef management initiatives are expanding under the Micronesia Challenge.

Reliable long-term monitoring data from **Guam** show some reefs in good condition while others have declined from pollution and COTS outbreaks, with decreased fish stocks in high use areas. Tourism and rapid military expansion will increase sedimentation, land-based pollution, coastal development and recreational use. Enhanced management will be required by Guam and USA, especially to control overfishing.

Long-term data report that coral reefs in the **Marshall Islands** are relatively healthy with high coral cover and abundant fish populations, especially on remote reefs. There is damage to reefs around populated islands from overfishing, coastal development and pollution, along with COTS and storms. Involvement in the Micronesia Challenge will improve capacity for management.

Substantial monitoring around **Palau** started after massive coral bleaching in 1998 and shows that damaged reefs are recovering with strong resilience, but some fish and invertebrate stocks have declined. Increased sedimentation from coastal development, road construction, deforestation, land-based pollution, and increasing pressure from population growth are damaging reefs. Palau is combating overfishing and actively protecting shark populations.

## **Country profiles: Polynesia Mana Node**

The Polynesian islands of American Samoa, Cook Islands, French Polynesia, Kiribati, Niue, Samoa, Tokelau, Tonga and Wallis and Futuna are assisted by the French CRILOBE centre in French Polynesia. Most of these islands are remote from human impacts and in good health, however overfishing, over-development and excessive sediment flows are damaging reefs around inhabited islands. Management effectiveness is variable with some particularly active through better capacity and resources.

Long-term data suggest that coral reefs in **American Samoa** are relatively stable and healthy with good long-term recovery potential. Fish catches and biomass have declined around the main island, Tutuila. Reefs have been damaged by pollution and sediment flows from coastal development and pig farms. Management efforts are weakened by inadequate fisheries management, enforcement and poor awareness.

Reefs around Rarotonga in the **Cook Islands** show strong coral reef recovery from COTS outbreaks in the 1990s. Target fish species, especially parrotfish, have declined. Damage has been caused by COTS, storms and cyclones, land-based pollution, coastal development, sedimentation, and declining water quality. Reef management varies considerably especially where traditional management exists.

The extensive monitoring in **French Polynesia** has documented many cycles of damage and recovery, especially on Moorea. Reef threats vary considerably from mild overfishing on remote atolls to over-exploitation, coastal development, land-based pollution on the populated high islands, in parallel with coral bleaching and COTS outbreaks. Reef management is actively improving with more MPAs, including some co-managed with communities.

Limited data are available from **Kiribati**, but most reefs are relatively healthy, with damage from coastal development and pollution around Tarawa. Resources have declined around towns,

while the unpopulated Phoenix Islands are relatively pristine and protected as the Phoenix Islands Protected Area; there is little effective management elsewhere.

Monitoring on **Niue** after Cyclone Heta in 2004 shows reef recovery; but there is over-exploitation of several species, and pollution and sedimentation from land-based sources, inadequate waste management and contamination by agricultural chemicals. Niue has launched 3 new MPAs, but capacity is low.

Reefs in **Samoa** are recovering after Cyclone Heta in 2004 and now are relatively healthy with strong resilience. The abundance and size of some fish populations, especially parrotfish, is low around urban developments. Damage from pollution, sedimentation, as well as from COTS outbreaks, cyclones and from climate change related coral bleaching, has been observed. Community-Based Fisheries Management shows positive results.

Anecdotal reports of reefs in **Tokelau** indicate damage from cyclones and COTS with low coral cover evident. Target fish species have declined through over-harvesting with more efficient fishing practices. Continued traditional management will prove the most effective method for reef conservation.

The occasional surveys of reefs in **Tonga** show relatively low coral cover, with some increases between 2002 and 2008. Overfishing is a significant threat to fish and invertebrate stocks. Other threats are pollution, declining water quality, sedimentation and coastal development, severe storms, COTS outbreaks, tsunamis and volcanic activity. Community-based and government management actions are needed to conserve the reefs and resources.

**Wallis & Futuna** is a territory of France where monitoring started recently. The reefs are threatened by forest clearing, coastal development, pollution, over-fishing and destructive fishing. This has led to bans on some practices and actions by the French government to improve management on these 3 remote islands (Wallis, Futuna and Alofi).














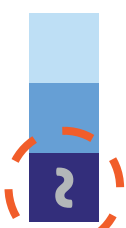
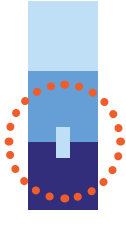
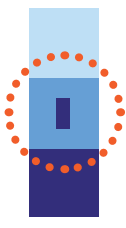




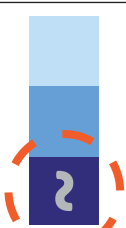
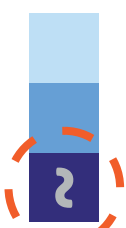
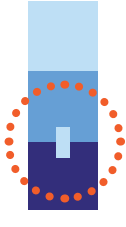
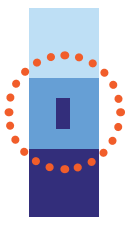




The coral reefs of the **Hawaiian Archipelago** vary considerably. There is well documented damage from pollution and over-exploitation of reefs around the 'main' Hawaiian Islands (MHI) with relatively large human populations; whereas the remote Northwestern Hawaiian Islands (NWHI) are virtually unpopulated and under strict protection with virtually no exploitation and pollution. The MHI coral reefs are particularly important for tourism which is the major economic activity and recognition of this is stimulating stronger and more cooperative management activity. Declaration of the Papahānaumokuākea Marine National Monument has meant that an enormous area of relatively pristine coral reefs is now given even greater protection, especially for the many endemic, rare, threatened and endangered species.

A short summary on the Great Barrier Reef of **Australia** is included in this report. The recent Outlook report was used as the model for this larger-scale report on the wider Pacific <sup>(5)</sup>. The final conclusion of that report was that the future outlook of the GBR was poor, even though this reef system is regarded as the best researched, monitored and managed in the world. The poor assessment was based on some land-based pollution and fishing pressures, but especially on predicted threats from climate-related threats of warming and acidifying seas that could overwhelm the inherent resilience of these extensive reefs.










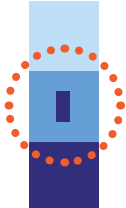
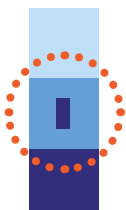
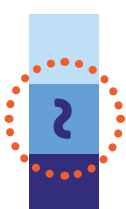
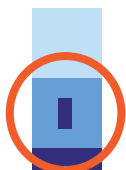
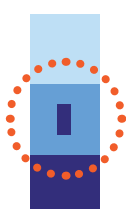

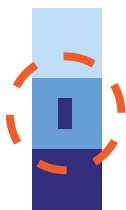
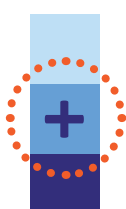
**Caveats:** This report was prepared as a contribution to the International Coral Reef Initiative by a partnership of people from the Global Coral Reef Monitoring Network, the World Resources Institute, the Institute for the Coral Reefs of the Pacific (IRCP) and the Centre de Recherches Insulaires et Observatoire de L'Environnement de Polynésie Française (CRIOBE), and the Coral Reef InitiativeS for the Pacific (CRISP). The conclusions and recommendations within this report are solely those of the authors and contributors and do not necessarily represent the official positions of these organisations.



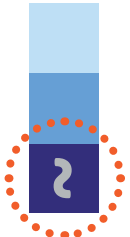

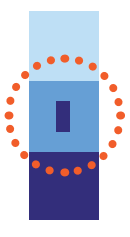
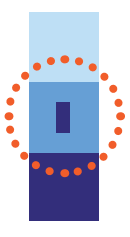


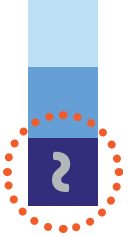
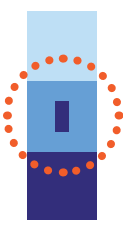
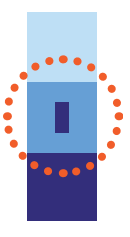

Situation over long term time scales		Evidence of change	Altered	High confidence	Medium confidence	Low confidence	Directions of current trend
Stable	Altered	+	-	~	+	-	~
Country	Reef Condition	Reef Health and Resilience	Reef Resource Use	Factors Affecting Reef Health	Management and Governance		
<b>Fiji</b>						The reliable and consistent monitoring data for Fiji indicates that most coral reefs are in good condition and currently recovering from previous disturbances (coral bleaching, COTS and cyclones). There is little evidence of persistent declines in reef condition and health, and recovery rates indicate good resilience. However, other reefs show signs of chronic stress and impacts from fishing, sedimentation and pollution from land-based sources, coastal development and population growth. Climate change, through coral bleaching and sea level rise, could have serious ramifications. The 2011 Reefs at Risk Revisited report estimates that all Fijian reefs will be threatened by 2030, with more than 65% at high, very high or critical threat levels. Fiji has the legislative base for effective management, but most coral reef management is at the community level; more information is needed to assess effectiveness of management efforts.	
<b>Nauru</b>						The few survey data from Nauru suggest some differences in reefs around the island, but the information is insufficient to describe status or trends. Long-term monitoring started in 2004 and should be continued. Social and economic data show intensive use of reef resources, with increasing effort coupled with decreasing resources; there are anecdotal reports of over-exploitation. Nauru's reefs have been damaged from previous phosphate mining and coastal development. Risk assessments identify Nauru as vulnerable to damage from climate change and population growth. Few management tools and logistic resources exist to address these issues; thus management needs to improve to ensure sustainable use of Nauru's reefs.	


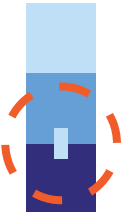
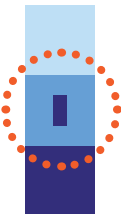
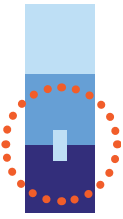
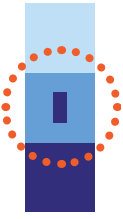
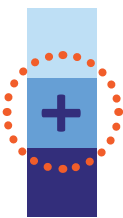


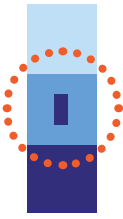

 Stable  Evidence of change  Situation over long term time scales	Country	 High confidence  Medium confidence  Low confidence	 +  -  Directions of current trend		
Evidence of change Situation over long term time scales	Reef Condition	Reef Health and Resilience	Reef Resource Use	Factors Affecting Reef Health	Management and Governance
 Stable  Evidence of change  Situation over long term time scales					
 Stable  Evidence of change  Situation over long term time scales					
 Stable  Evidence of change  Situation over long term time scales	<b>New Caledonia</b>	<p>The long-term data from 10 sites around Noumea show stable trends and little evidence of decline. There is strong ability to recover from disturbances, although coral recruitment appears to be naturally low which reduces recovery potential. Information is insufficient to determine trends in reef resource use although most reef resources appear stable, with some declines in a few species such as clams and bêche-de-mer. There is also little information on factors affecting coral reefs; risk assessments suggest threats from sediment runoff and pollution for some reefs, and concern over potential effects of future population growth and climate change. Management is improving with increases in MPAs and investment in management and enforcement.</p>	<p>The few survey data from PNG indicate that the reefs are healthy with strong ability to recover from disturbances. However, some coastal reefs show damage from sediment, pollution and overfishing. There are increasing pressures on reef resources from harvesting with declines of some species in specific areas. Many reefs, however, are remote with low levels of harvesting. Anecdotal reports and risk assessments indicate that PNG's reefs are affected by pollution and sedimentation, mining and poor land-use practices. High population growth will increase pressure on reefs. PNG has strong legislative mechanisms, but management is limited by a lack of resources, capacity and political will, and ability to access to remote locations.</p>	<b>Papua New Guinea</b>	

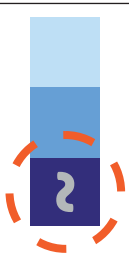
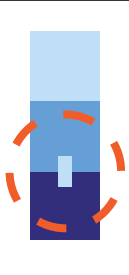
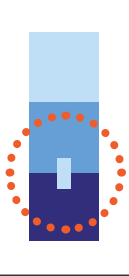
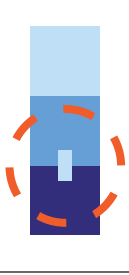

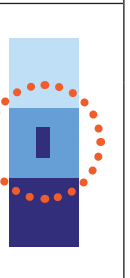
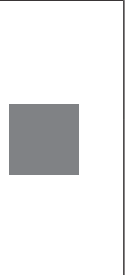
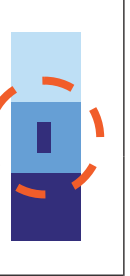
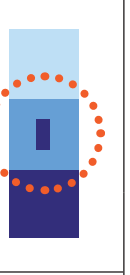
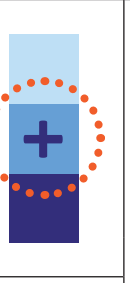
Stable		Evidence of change over long term time scales		Altered		High confidence		Medium confidence		Low confidence		+ - ~ Directions of current trend	
Country	Reef Condition	Reef Health and Resilience	Reef Resource Use	Factors Affecting Reef Health	Management and Governance								
<b>Solomon Islands</b>						<p>Survey data from the Solomon Islands are limited to 2006-07 in the Western province. These reefs have high coral cover, with natural events being the main drivers of change. There is insufficient information to describe trends in reef health and reef resource use; but there is low density and abundance of harvested fish and invertebrates in some areas, and some species such as sea cucumbers and aquarium species appear depleted. The primary factors affecting reefs are land-based pollution, tsunamis and earthquakes; population growth will pose an additional stress. Management trends are unknown although several challenges are identified. Locally Managed Marine Areas and other community efforts are promising management tools.</p>							
<b>Tuvalu</b>						<p>Coral reef monitoring in Tuvalu has been sporadic and limited to the main island of Funafuti. The reefs appear stable, but the long-term trends, patterns of reef resource use are unknown. Anecdotal reports suggest over-harvesting of some fish stocks and sea cucumbers. Other damaging factors include pollution and coastal development (especially around Funafuti); population growth will increase these stresses. Tuvalu is particularly at risk of climate change. There is legislation to manage the reefs, but effectiveness is unknown. Community based management could be an effective mechanism to address specific threats.</p>							

 Stable  Evidence of change Situation over long term time scales	 Altered	 High confidence	 Medium confidence	 Low confidence	 Directions of current trend
Country	Reef Condition	Reef Health and Resilience	Reef Resource Use	Factors Affecting Reef Health	Management and Governance
<p><b>Vanuatu</b></p> <p>Valuable baseline data were collected for shallow reefs in Vanuatu from 2005 to 2007, but these were insufficient to describe long-term trends and health status. Reef resource use data indicates some harvested stocks have declined, which has led to bans on trade in some species (sea cucumbers, green snail, triton), and low densities of targeted finfish and invertebrates in some locations. The primary factors affecting reefs are natural disasters (e.g. cyclones, tsunamis), land-based pollution, sedimentation and population growth. There is legislation for the management of coral reefs, but management effectiveness is not well documented; however, community based management efforts have shown positive results.</p>					
<p><b>Commonwealth of the Northern Mariana Islands</b></p> <p>The historical data on coral reefs in the CNMI suggest that reefs in the more populated southern regions have reduced coral cover, altered species composition and reduced biomass of some reef fishes; this includes decreased health and resilience around Saipan. Fish catches have declined with lower biomass around populated islands compared to remote areas. Declining water quality, pollution, coastal development and sedimentation are damaging some reefs around the populated islands. In contrast, the reefs in less populated and remote northern islands are relatively healthy. Climate change is predicted to have significant effects on the reefs. There are programs to manage the reefs with positive results from some initiatives. However, more data are needed in order to describe management effectiveness.</p>					








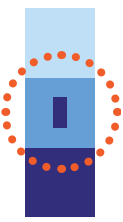




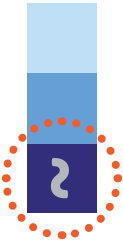

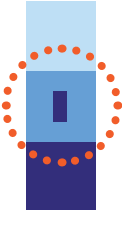
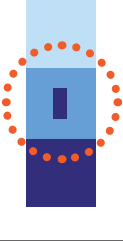

Stable		Evidence of change		Altered		High confidence		Medium confidence		Low confidence		Directions of current trend	
Country		Reef Condition		Reef Health and Resilience		Reef Resource Use		Factors Affecting Reef Health		Management and Governance			
<b>Federated States of Micronesia</b>							<p>Long-term reef monitoring in the FSM occurs a few sites and shows reefs with high coral cover, but with damage from human activities (especially those near Pohnpei). The long-term trends in reef health and reef resource use is uncertain. Anecdotal reports suggest declining fish populations and collapses of sea cucumber and trochus fisheries. Destructive fishing occurs in some areas; other damaging factors include sedimentation and pollution around populated islands, coastal development, and increasing pressures from growing populations. FSM will also be affected by climate change. Some recent reef management initiatives are promising; but the effectiveness of these measures is unknown.</p>						
<b>Guam</b>							<p>Long-term monitoring of Guam's coral reefs has recently begun, but there are data from the last 40 years. Some reefs are in good condition while other reefs show signs of long-term decline from the status in the 1960s. There are clear signs of declining reef health in some areas. There are good data on reef resource use and some fish communities that show declines in some fish stocks, and damage from tourism and recreational use in high use areas. Some of Guam's coral reefs have been affected by sedimentation, land-based pollution and coastal development; these pressures will increase with more population and expanded military bases. Guam's reefs are also affected by storms, COTS, and are at risk from climate change. Guam has management tools and strategies to address some of the pressures facing coral reefs, with efforts showing signs of success. However, there are few effective fishing regulations, and management challenges are increasing.</p>						

Stable	Evidence of change	Altered	High confidence	Medium confidence	Low confidence	+ - ~ Directions of current trend
Situation over long term time scales						
Country	Reef Condition	Reef Health and Resilience	Reef Resource Use	Factors Affecting Reef Health	Management and Governance	
<b>Republic of the Marshall Islands</b>						
<p>Limited long-term survey data for the RMI provide valuable baseline information, and show reefs that are relatively healthy with high coral cover and abundant fish, especially in remote locations. However, there are declines in status around the populated islands. The data are insufficient to describe trends in reef health, patterns of resource use and effects on reefs. Anecdotal reports indicate that fishing and harvesting have reduced reef resources more around populated than remote islands. Increasing pressures from population growth, coastal development, pollution, crown-of-thorns seastars and storms are damaging the reefs; and climate change will exacerbate these declines.</p>						
<b>Republic of Palau</b>						
<p>The long-term data from Palau show that the reefs seriously damaged by coral bleaching in 1998 are recovering. This indicates long-term stability and good health and resilience. Fisheries catch data, anecdotal reports and risk assessments suggest declines in some fishes and invertebrates, but more data are needed. Other factors affecting Palau's coral reefs include sedimentation from development and deforestation, land-based pollution, coastal development, and increasing pressures from population growth; climate change will add to these stresses. Palau has many promising programs to manage coastal resources, including bans on harvesting some species. However, Palau still faces management issues, such as illegal fishing and more information is required to describe management effectiveness.</p>						










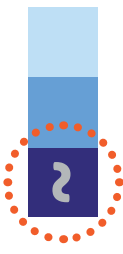
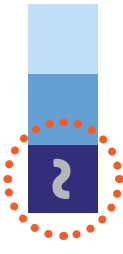
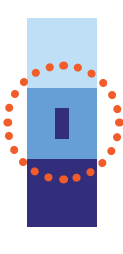
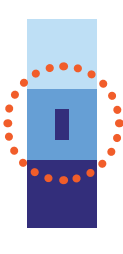


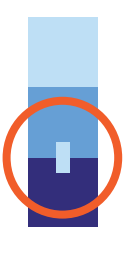
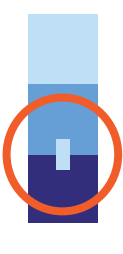
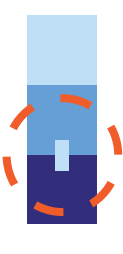
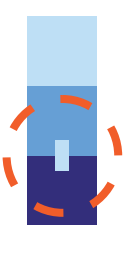


Stable	Evidence of change over long term time scales	Altered	High confidence	Medium confidence	Low confidence	+ - ~ Directions of current trend
Country	Reef Condition	Reef Health and Resilience	Reef Resource Use	Factors Affecting Reef Health	Management and Governance	
<b>American Samoa</b>						<p>Long-term data from American Samoa suggest that the coral reefs are relatively stable (i.e. they recover from disturbances) and healthy. The trend and recruitment data suggest resilience, although some reefs have not recovered to the 1970s baselines, suggesting some damage, especially around Tutuila where fish catches have also declined. There are also changes in reef fish and coral composition; with reduced fish biomass around populated islands compared with remote locations. Reefs have experience localised pollution and sediment damage, and are also threatened by coastal development, increasing populations, storms, COTS and the emerging effects of climate change. There is a legislative basis and capacity to address some issues, but fisheries management and enforcement remain challenges.</p>
<b>Cook Islands</b>						<p>Long-term data for the Cook Islands is restricted to the main island of Rarotonga, but this shows strong coral reef recovery from COTS outbreaks in the 1990s. Reef fish community changes appear to be explained by natural variation, but the data are insufficient to describe reef health and resilience. Targeted reef species, especially parrotfish, have declined and the long-term trends are uncertain. The reefs have been damaged by COTS, storms and cyclones, and climate change will increase this vulnerability. Some reefs are threatened by land-based pollution, coastal development, sedimentation, and declining water quality. Reef management varies considerably between islands; there are many traditional management arrangements. However, trends in management and effects on coral reefs are unclear.</p>

Stable	Evidence of change over long term time scales	Altered	High confidence	Medium confidence	Low confidence	+ - ~ Directions of current trend
Country	Reef Condition	Reef Health and Resilience	Reef Resource Use	Factors Affecting Reef Health	Management and Governance	
<b>French Polynesia</b>						
<b>Kiribati</b>						
	<p>French Polynesia's reefs have a long history of research and monitoring, focused mainly on the Society Islands with some studies done on the more remote reefs. Reefs are generally healthy, especially those exposed to few human pressures. The reefs are damaged by COTS outbreaks, storms and cyclones, and coral bleaching, but the reefs usually recover. Some reefs around the main populated islands have declined, with changed coral and fish communities and inshore reefs lost from pollution and coastal development. Over-harvesting occurs around populated areas. Tourism is a major non-extractive use of reefs, but tourism increases coastal development and demand for reef resources. There is a strong basis and capacity for management that is already implemented, but compliance and enforcement needs improvement in some areas along with measures to determine management effectiveness.</p>					
	<p>Monitoring in Kiribati is focused on the Gilbert Islands such as Tarawa, and the Phoenix Islands, although monitoring has begun in Kiritimati (Line Islands). The data indicate relatively healthy reefs, with some human-induced damage around the capital Tarawa and coral bleaching on North Tarawa and the Phoenix Islands. The long-term trends in reef health and resilience are uncertain, but new monitoring has started. Resources around towns on Tarawa and Kiritimati have declined, while the unpopulated Phoenix Islands are relatively pristine. Coral bleaching has damaged many reefs, and low-lying islands are vulnerable to sea level rise. Coastal development and pollution cause local damage to reefs, and there are few effective management measures in operation, demonstrating significant management challenges. The establishment of the Phoenix Islands Protected Area was a major step in protecting Kiribati's coral reefs.</p>					



 Stable Situation over long term time scales	 Evidence of change over long term time scales	 Altered	 High confidence	 Medium confidence	 Low confidence	 Directions of current trend
Country	Reef Condition	Reef Health and Resilience	Reef Resource Use	Factors Affecting Reef Health	Management and Governance	
<b>Niue</b>						<p>Monitoring on the west coast of Niue showed a decline in coral cover after Cyclone Heta in 2004, but with some signs of recovery since. The data are insufficient to describe trends in reef health, resilience, and the use of reef resources, although there are signs of over-exploitation of several species. Other factors damaging factors are pollution and sedimentation from land-based sources, inadequate waste management and contamination by agricultural chemicals. Niue has implemented a range of coral reef management programs, including 3 new MPAs with fishing restrictions; these are promising signs.</p>
<b>Samoa</b>						<p>Monitoring in Samoa started in the 1980s; but systematic long-term monitoring only began in 2002. These surveys indicate healthy coral reefs that are recovering after Cyclone Heta in 2004. This recovery suggests strong resilience, but more data are needed to describe trends in reef status and health. Patchy data on reef resource use suggest declines in diversity and abundance of some fish groups, especially parrotfish, and decreased fish size. Some reefs have been affected by pollution and sedimentation, as well as COTS, cyclones and coral bleaching; the bleaching is linked to increasing sea temperatures from climate change. A variety of management initiatives have been established and the Community-Based Fisheries Management Program shows positive results.</p>

Stable	Evidence of change	Altered	High confidence	Medium confidence	Low confidence	+ - ~ Directions of current trend
Country	Reef Condition	Reef Health and Resilience	Reef Resource Use	Factors Affecting Reef Health	Management and Governance	
<b>Tokelau</b>						Sporadic surveys and anecdotal reports since the 1960s indicate damage from cyclones and COTS on Tokelau's reefs. Long-term monitoring started recently showing baseline live coral cover of 12 to 30%, but more data are required to describe trends in reef condition, reef health and trends in reef resource use; although anecdotal evidence suggests declines in some targeted species and concerns about over-harvesting through the use of more efficient fishing practices. Risk assessments have identified coastal development as a threat to the reefs. Tokelau's low lying islands are particularly at risk from rising sea levels. Tokelau relies on traditional management systems and reports indicate varying effectiveness between locations; however the effectiveness of governance and management is unknown.
<b>Tonga</b>						Periodic surveys since the mid 1990s and long-term monitoring since 2004 show that Tonga's coral reefs have relatively low coral cover, but cover has increased at some sites between 2002 and 2008. More data are needed to describe overall trends in reef status, as well as reef health and resilience. Overfishing is a significant threat with evidence of declining finfish and invertebrate stocks, including local extinctions. The reefs experience severe storms, COTS outbreaks, tsunamis and volcanic activity, as well as pollution, declining water quality, sedimentation and coastal development. Establishing effective legislation, enforcement and management are significant challenges in Tonga, although several community-based management initiatives show promising results.

 Stable  Evidence of change over long term time scales Situation over long term time scales	 Altered  High confidence  Medium confidence  Low confidence Directions of current trend   	Management and Governance	Factors Affecting Reef Health	Reef Resource Use	Reef Health and Resilience	Reef Condition
<b>Wallis and Futuna</b>						
<p>The available information about reefs in Wallis and Futuna suggests there is high coral cover and diversity, although some fringing reefs around Alofi and Futuna show signs of local stress. Most reefs appear to show recovery and recruitment of new corals following disturbances, suggesting good health and resilience, but the long-term trends are unknown. The available data suggest declines in reef resources and stresses affecting the coral reefs include sedimentation, pollution and coastal development. Climate change is predicted to have significant effects on these reefs. Management arrangements have been developed but have not been completely implemented, and the efficacy is not known.</p>						
<b>Hawaiian Islands</b>						
	<p>There is good information about coral reefs of the Hawaiian Islands. Reefs in the more remote Northwestern Hawaiian Islands (NWHI) are in good condition, while the condition of reefs in the Main Hawaiian Islands (MHI) varies with some reefs showing signs of stress and decreased health and resilience. Fish populations in the remote NWHI are relatively pristine compared to the MHI, with fishing impacts increasingly evident in more accessible fishing grounds. Tourism is a major industry in the MHI and may cause localised impacts. Some reefs in the MHI are also affected by pollution, sedimentation, invasive species and coastal development. Marine debris is an issue in both the MHI and NWHI, and climate change could have significant impacts on reefs throughout the archipelago. Management planning, capacity and implementation are generally strong, especially with the designation of large MPAs. However, there is room to improve coordination and enforcement, particularly in the MHI.</p>					

## References

1. Burke L, Reytar K, Spalding M *et al.* (2011). *Reefs at Risk Revisited*. Washington DC: World Resources Institute, 114 p. <http://www.wri.org/project/reefs-at-risk>.
2. Wilkinson C (2008). *Status of Coral Reefs of the World: 2008*. Global Coral Reef Monitoring Network & Reef and Rainforest Research Centre, Townsville, 304 p.
3. Bell JD, Kronen M, Vunisea A *et al.* (2009). Planning the use of fish for food security in the Pacific. *Marine Policy*, 33: 64-76
4. UNEP/SOPAC (2005). *Environmental Vulnerability Index*. United Nations Environment Programme/Pacific Islands Applied Geoscience Commission. <http://www.vulnerabilityindex.net/>
5. Great Barrier Reef Outlook Report (2009). [www.gbrmpa.gov.au/corp\\_site/about\\_us/great\\_barrier\\_reef\\_outlook\\_report](http://www.gbrmpa.gov.au/corp_site/about_us/great_barrier_reef_outlook_report).