



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

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## APPENDIX I: DETAILS OF DESCRIPTIVE THEMES

### Status of coral reefs

This theme describes the current condition of coral reef ecosystems, but also the associated habitats such as mangroves which may be closely linked with coral reefs in some locations. Coral reef condition is usually expressed as a percentage of living coral cover of communities at monitored sites. Coral reefs are dynamic systems that experience periodic disturbances and declines that are usually followed by recovery in following years. This theme provides an indication of the current status of coral reefs compared to long-term trends.

This theme was described using status and trend information on coral reefs sourced from Reef-Base Pacific, the GCRMN Status of Coral Reefs of the World 2004 and 2008, the Status of Coral Reefs in the South West Pacific 2004, and specific scientific publications and reports.

**Stable:** Coral cover is generally high and has been stable or increasing at most sites. No evidence of widespread and prolonged degradation of coral cover, or signs of stress or damage.

**Evidence of change:** Coral cover is high and stable at some sites, is increasing at other sites, but some sites are showing continued long-term declines. Signs of damage or stress evident at some sites.

**Altered:** Coral reef resources are at an altered state compared to previous conditions, including long-term declines in coral cover at many sites. Widespread signs of coral stress or damage.

### Coral reef health and resilience

In this report, the health and resilience of coral reefs has been described by the level to which their ecological processes and community structure remain undisturbed, and by examining evidence of their ability to recover from disturbances. This relies on data such as trends in coral recruitment, and surveys of reef associated animals and plants such as macroalgae and fishes (predators, herbivores, fished species) to determine the level of disruption to reef communities. Further, long-term monitoring data provide information about cycles of disturbance and recovery. Collectively, these data provide important information about the state of the reef's *ecological infrastructure*, that is, the underlying ecological processes (e.g. recruitment, reproduction, nutrient cycling, predation, competition etc.) and community structures (e.g. abundance of predators, herbivorous fishes, macroalgae, invasive species) that are necessary to maintain coral reef ecosystems. These indices are available for a few countries in the Pacific, and cover some of the main variables recommended by the IUCN resilience assessment protocol for assessing coral reef resilience<sup>(1)</sup>.

This theme was described using information on reef health and processes, and from trend data for patterns of disturbance and recovery of coral reefs. These data were sourced from ReefBase Pacific; the GCRMN Status of Coral Reefs of the World 2004, 2008 reports; the Status of Coral Reefs in the South West Pacific 2004, 2009; and scientific publications and reports specific to each country.

**Stable:** coral reef community structures appear to be stable and relatively intact compared to available baseline data or pristine reference sites, with good representation of key reef organisms such as predators and herbivores. Little evidence of altered or degraded reef ecosystem processes (e.g. recruitment failures, phase shifts in coral communities, losses of biodiversity), or major disruptions to reef communities (e.g. outbreaks of invasive species, mass mortality events, altered community structure). After disturbance events (e.g. coral bleaching,

cyclones, crown-of-thorns starfish outbreaks), reefs recover to pre-disturbance state within expected time-frames.

**Evidence of change:** emerging evidence of changes in coral reef community structures at some sites, e.g. changes in the density or abundance of organisms such as large reef fishes between fished and unfished areas, changes in density of herbivores (e.g. parrotfish or urchins). Emerging evidence of changes in reef ecosystem processes (e.g. recruitment failures, phase shifts in coral communities, losses of biodiversity, increased recruitment following protection of spawning sites), evidence of disruptions to reef communities (e.g. spread of invasive species, population explosions of certain species, mass mortality events, altered community structure). Reefs show some recovery after disturbances, but recovery may be slower than expected or incomplete.

**Altered:** evidence of widespread changes in, and disruptions to, reef community structures. For example, altered community composition, reduced abundance, density or diversity of key species groups, clear evidence of widespread changes in reef ecosystem processes (e.g. recruitment failures, phase shifts in coral communities, losses of biodiversity), major disruptions to reef communities (e.g. outbreaks of invasive species or population explosions, mass mortality events, altered community structure). Reefs do not show signs of expected recovery after disturbances.

### Use of reef resources

The theme describes trends in the use of coral reefs and other coastal resources such as mangroves that may help to sustain healthy reef ecosystems. This includes commercial uses such as fishing, aquaculture, tourism and aquarium collecting, as well as traditional and artisanal uses of coastal resources. This theme also includes information on emerging threats. Patterns of use may affect the health and resilience of coral reefs<sup>(1)</sup>.

This theme was described using information available on the use of reef resources. Data were sourced from ReefBase Pacific; the GCRMN Status of Coral Reefs of the World 2004, 2008 reports; the Status of Coral Reefs in the South West Pacific 2004, 2009; the UNEP/SOPAC Environmental Vulnerability Index 2005; the Pacific Ocean Synthesis Report 2009; Reefs at Risk Revisited 2011, the FAO Fisheries Database; and publications and reports specific to each country.

**Stable:** Resource use appears to be stable with no evidence of significant damage or long-term impacts to reef condition, health or resilience. Trends in resource use do not appear to threaten long-term sustainability of exploited resources. If such changes are evident, they occur on a very small scale, and are localised to a handful of reefs or locations. Destructive use of reefs and resources (e.g. cyanide or bomb fishing, coral mining, mangrove destruction) is extremely rare or non-existent.

**Evidence of change:** resource use patterns are changing that may be increasing or decreasing pressure on coral reefs. Evidence that resource use is causing changes in the condition and health of some exploited resources and habitats. Trends in resource use may threaten the long-term sustainability of exploited resources or the health of habitats. These changes and effects are evident in several reefs and locations. Destructive use of reefs and resources (e.g. cyanide or bomb fishing, coral mining, mangrove destruction) known to occur in a few locations.

**Altered:** resource use patterns have changed, and current resource uses have increased pressure on reef resources and threaten the long term sustainability. Evidence of negative changes in the condition and health of resources and habitats. These changes and effects may operate across numerous reefs and locations. Destructive use of reefs and resources (e.g.

cyanide or dynamite fishing, coral mining, mangrove destruction) occurs in a number of locations.

### **Factors affecting reef health and condition**

This theme describes large-scale factors and processes that affect coral reef condition and health, and may present risks to coral reef ecosystems. These 'risk factors' may operate at local, regional and global scales. Localised factors are specific to individual locations or countries, and tend to be related to human use and ecological impacts such as the effects of land use, population growth, coastal development, pollution and mining, and losses of biodiversity. Regional and global factors operate over larger areas and include factors such as geophysical forces and events (earthquakes, tsunamis), oceanography, climate and climate change, and severe weather events. Many of these factors are specifically considered in the Reefs at Risk Revisited assessment process, and are recommended for assessment by the IUCN coral reef resilience assessment protocol (Obura and Grimsditch, 2009)

This theme was described using information available on the environmental risks, patterns and trends, and existing risk assessments. Data was sourced from ReefBase Pacific; the GCRMN Status of Coral Reefs of the World 2004, 2008; the Status of Coral Reefs in the South West Pacific 2004, 2009; and the United Nations Population Division, and publications and reports specific to each country. Particular use was made of the UNEP/SOPAC Environmental Vulnerability Index 2005, the Pacific Ocean Synthesis Report 2009, and the Reefs at Risk 2011.

**Stable:** There are few risk factors identified that are likely to cause significant changes in reef condition and health. Little evidence of change in the frequency, intensity, or number of risk factors. Little evidence that these factors have caused long-term changes in reef condition or health. Population growth is not predicted to change coral reef condition or health.

**Evidence of change:** Some risk factors identified have caused, or could cause, significant changes in reef condition and health. The frequency and/or intensity or number of existing risk factors is changing, new risk factors may be emerging. There is evidence that these factors have caused significant changes in reef condition or health in some locations. Population growth is likely to increase pressure on the natural environment.

**Altered:** Many risk factors are identified that have significantly changed reef condition and health. The frequency and/or intensity of these risk factors has changed or is projected to rise, increasing the degree of impact on coral reefs. There have been numerous impacts on coral health from these risk factors with little evidence of recovery. Population growth is placing significant pressures on the environment, projected population growth is likely to result in significant degradation of the environment.

### **Governance and management**

The theme attempts to provide a brief overview and description of the governance and management of Pacific coral reefs. Management is a very complex issue; for example, the IUCN framework for assessing management effectiveness includes assessment of 3 areas of management: 1. design/planning; 2. adequacy/appropriateness of planning; and 3. delivery/implementation of management<sup>(2)</sup>. This theme provides only a brief synthesis and description of each these 3 areas, focusing specifically on the design and implementation of MPAs, and management of coral reef fisheries.

This theme was assessed using information available on the management of reef resources. Data were sourced from ReefBase Pacific; the GCRMN Status of Coral Reefs of the World 2004, 2008; the Status of Coral Reefs in the South West Pacific 2004, 2009; and any publications and reports specific to each country. Particular use was made of the UNEP/SOPAC Environmental

Vulnerability Index 2005, the Pacific Ocean Synthesis Report 2009, and the Reefs at Risk Revisited 2011.

**Stable:** Comprehensive and appropriate management has been developed for coral reefs, and can potentially ensure long-term protection and sustainable use of reef resources. There is sufficient funding, support, capacity and infrastructure to implement and maintain management efforts, and management plans and programs are effectively implemented. There is little evidence of non-compliance with management, and management effectiveness is being assessed and improved where necessary.

**Evidence of change:** Some management plans and programs have been developed for coral reefs. While management may be bringing about positive changes in patterns of use and resource condition, long-term protection and sustainable use of reef resources has not been achieved. There is insufficient funding, support, capacity and infrastructure to fully implement the management plan, which is only partly operational. There is evidence of non-compliance in some areas. Management effectiveness has only partly been assessed.

**Altered:** Management plans or programs have not been developed for coral reefs, or if developed, are limited in scale, or have not been effectively implemented. This has led to alteration and degradation of coral reefs in many locations. There is a lack of resources, support, capacity and infrastructure to develop or implement management. There is evidence of non-compliance in many areas, or the level of compliance is unknown, and is not measured. The effectiveness of management is not assessed.

### References (Appendix 1)

1. Obura DO, Grimsdith G (2009). *Resilience Assessment of coral reefs – Assessment protocol for coral reefs, focusing on coral bleaching and thermal stress*, IUCN, Gland, Switzerland: IUCN working group on Climate Change and Coral Reefs, 70 pp. <http://www.iucn.org/cccr/publications/>
2. Hockings M, Stolton S, Leverington F *et al.* (2006). *Evaluating effectiveness: a framework for assessing management effectiveness of protected sites.*, Gland, Switzerland: IUCN. <http://www.iucn.org/cccr/publications/>



## **APPENDIX 2: INFORMATION, AGENCIES AND PROGRAMS**

This is a summary reports some of the agencies and organisations working towards coral reef monitoring and management in the Pacific, and which have assisted with this report (either directly or *via* obtaining data and information from their reports). This includes government agencies, inter-governmental agencies, NGOs and private organisations.

### **Centre de Recherches Insulaires et Observatoire de l'Environnement de Polynésie Française (CRIOBE)**

The CRIOBE is a research centre located in Moorea, French Polynesia, and part of the Centre National de la Recherche Scientifique (CNRS) French marine stations national network. It is also connected with the Practical School of High Studies (EPHE). With a staff of more than 50 including technicians and researchers, CRIOBE provides a research base for visiting researchers, undertakes theoretical and applied research, and supports education and training for post-graduate students. The CRIOBE coordinates ReefBase Pacific and coral reef monitoring efforts throughout Polynesia including long-term monitoring of reefs in French Polynesia and neighbor Pacific Islands Countries and Territories (PICTS).

<http://www.criobe.pf/>

### **Conservation International (CI)**

Conservation International was founded in 1987 as an NGO based in Virginia, USA, but with regional offices across the world including Fiji, Papua New Guinea, New Caledonia and Samoa in the Pacific. The CI mission is: Building upon a strong foundation of science, partnership and field demonstration, CI empowers societies to responsibly and sustainably care for nature, our global biodiversity, for the well-being of humanity. CI's Pacific projects include marine planning in New Caledonia, marine parks in Kiribati and Fiji, and sustainability projects.

[http://www.conservation.org/explore/asia-pacific/pacific\\_islands/pages/overview.aspx](http://www.conservation.org/explore/asia-pacific/pacific_islands/pages/overview.aspx)

### **Coral Reef InitiativeS for the Pacific (CRISP)**

CRISP is diverse program that aims to develop a vision for the future of coral reefs and the communities that depend on them. Through the CRISP, strategies and projects to conserve coral reef biodiversity, while developing the economic and environmental services that they provide are being explored and implemented. The CRSIP also helps to help foster collaboration and coordination between developed countries (Australia, New Zealand, Japan, USA), French overseas territories and Pacific Island developing countries. The CRISP funded through the French Development Agency (AFD) and comprises three major components: (1) Integrated Coastal Management and watershed management; (2) development of coral ecosystems; and (3) program coordination and development (including institutional support, technical support and extension). The CRISP is hosted by the SPC in Noumea, and has provided reports and information used in this report, including many of the case studies of projects and initiatives highlighted in Section 2 of this report.

<http://www.crisponline.net/Home/tabid/36/Default.aspx>

### **Global Coral Reef Monitoring Network**

The Global Coral Reef Monitoring Network (GCRMN) is an operational network of the International Coral Reef Initiative. Its programs are supported by a range of organizations, working to improve management and conservation of coral reefs by providing manuals, equipment, databases, training, problem solving. A major function of the GCRMN is to help facilitate, coordinate and support coral reef monitoring efforts around the world. The GCRMN also helps secure funding for reef monitoring, and all these activities are coordinated in a global network. One of the most important features of the GCRMN is its publication series on the status of coral

reefs around the world. These publications are one of the main information sources used in this report.

The core objectives of GCRMN are:

- To link existing organisations and people to monitor ecological and social, cultural and economic aspects of coral reefs within interacting regional networks.
- To strengthen the existing capacity to examine reefs by providing a consistent monitoring program, that will identify trends in coral reefs and discriminate between natural, anthropogenic, and climatic changes.
- To disseminate results at local, regional, and global scales on coral reef status and trends, to assist environmental management agencies implement sustainable use and conservation of reefs.

The GCRMN monitoring coordination is organised around GCRMN nodes which coordinate and facilitate monitoring efforts in participating countries. Experienced marine institutes assist in training, establishing of databases and problem resolution. The GCRMN Pacific nodes are currently located at the University of the South Pacific (Fiji), CRIOBE (Moorea, French Polynesia) and the Palau International Coral Reef Center (PICRC). The GCRMN encourages the use of Reef-Base at WorldFish Center to store data, especially metadata.

<http://www.gcrmn.org/>

### **Global Environment Facility, Coral Reef Targeted Research and Capacity Building for Management (CRTR)**

The Coral Reef Targeted Research & Capacity Building for Management (CRTR) Program is an international coral reef research initiative that provides a coordinated approach to credible, factual and scientifically-proven knowledge for improved coral reef management. CTFR partners include the Global Environment Facility, the World Bank and the University of Queensland, and 50 other organisations around the world. The CRTR goal is to address key gaps in the world's knowledge and understanding of coral reefs, and put new knowledge and technology into the hands of decision-makers and reef managers where it can make a difference. By addressing these knowledge gaps, the program can identify management options to address pressures on coral reefs.

The CRTR Program is coordinated through Centres of Excellence in the Philippines, Mexico, Zanzibar and Australia, which reflect the regional distribution of coral reefs and the management initiatives underway to conserve them. These centres are the focal points for research carried out by international scientists. Major areas of research include coral bleaching, ecological connectivity and processes, coral disease, modeling and decision support, remote sensing and reef restoration and remediation. CTFR projects provide some of the case studies used in section 2 of this report.

<http://www.gefcoral.org/Home/tabid/2967/language/en-US/Default.aspx>

### **Institute for the Coral Reefs of the Pacific (IRCP)**

The IRCP, a scientific institute of the EPHE, works closely with CRIOBE on information and awareness raising activities, and actively participates in research and management of coral reefs in the South and Central Pacific.

The IRCP has 4 main objectives:

- To facilitate monitoring and observations of South and Central Pacific coral reefs;
- To provide a base that facilitates and promotes research on the environments, habitats and ecosystems of the Pacific, and establish a link between fundamental research, conservation and training on coral reef issues;
- To promote social and human sciences as complementary tools for coral reef sustainable management; and

To enhance communication, awareness raising about Pacific coral reefs, and provide high level advice and expertise on coral reef issues in multidisciplinary projects aimed at coral reefs con-

ervation in the context of sustainable development, thus contributing to the future of coral reefs and the people that depend on them.

<http://www.ircp.pf>

### **Ministry of the Environment, Japan (MOEJ)**

The Ministry of the Environment coordinates Japan's coral reef management, and it has supported coral reef monitoring and MPA networking in the East Asian Seas Region.

<http://www.env.go.jp/en/> & [http://www.coremoc.go.jp/english/top\\_e.html](http://www.coremoc.go.jp/english/top_e.html)

### **National Oceanic and Atmospheric Administration (NOAA), USA**

NOAA's Coral Reef Conservation Program (CRCP) supports effective management and sound science to preserve, sustain and restore valuable coral reef ecosystems for future generations. CRCP is a cross-cutting program that brings together expertise from a wide array of NOAA offices. CRCP works in strong partnership with coral reef managers to reduce harm to, and restore the health of, coral reefs (including deep-water corals) by addressing top national threats and local management priorities through conservation activities.

<http://coralreef.noaa.gov>

### **Secretariat of the Pacific Community (SPC)**

The SPC has a long history of working with communities across the Pacific. It is an intergovernmental organisation that provides technical and policy advice and assistance to its Pacific Island members. SPC was established as an international organisation in 1947 and has 26 member countries and territories including American Samoa, Australia, Cook Islands, Federated States of Micronesia, Fiji Islands, France, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, New Zealand, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Pitcairn Islands, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, United States of America, Vanuatu and Wallis and Futuna. The main SPC headquarters is in Nouméa, New Caledonia, but it has regional offices in Suva (Fiji), and Pohnpei (Federated States of Micronesia). The SPC also has country offices in Papua New Guinea, Solomon Islands and Vanuatu.

- The SPC's mission is to help Pacific Island people position themselves effectively to respond to the challenges they face and make informed decisions about their future and the future they wish to leave for the generations that follow.
- The SPC's vision is a secure and prosperous Pacific Community, whose people are educated and healthy and manage their resources in an economically, environmentally and socially sustainable way.

<http://www.spc.int>

### **Secretariat of the Pacific Regional Environment Programme (SPREP)**

SPREP is a regional organisation established by the governments and administrations of the Pacific region. It is based in Apia, Samoa, with over 70 staff, and is the Pacific region's major intergovernmental organisation charged with protecting and managing the environment and natural resources. SPREP also manages the Pacific Environmental Information Network which was a major source of the information used in this report.

SPREP's mandate is to promote cooperation in the Pacific islands region and to provide assistance in order to protect and improve the environment and to ensure sustainable development for present and future generations. SPREP has 21 Pacific island member countries and four countries with direct interests in the region

<http://www.sprep.org>

### **University of the South Pacific (USP) – Institute of Marine Resources**

The University of the South Pacific (USP) Institute of Marine Resources (IMR) is based in Fiji. The Institute provides scientific and technical skills, and capacity-building, in aquaculture, marine resource assessments, marine surveying, coral reef monitoring/ database maintenance, and



socio-economic analysis for fisheries and aquaculture. Current activities centre on aquaculture, on coral reef monitoring, and on marine biodiversity assessment. The Institute also coordinates the South-West Pacific node of the Global Coral Reef Monitoring Network (GCRMN), providing much of the information on the SW Pacific coral reefs used in this report.

<http://www.usp.ac.fj/index.php?id=imr>

### **U.S. Department Of State**

The Department of State is the foreign policy arm of the United States Government. The Department is dedicated to creating a more secure, democratic and prosperous world for the benefit of the American people and the international community. Within the Department, the Bureau of Oceans and International Environmental and Scientific Affairs is responsible for advancing sustainable development and natural resource conservation, including aspects related to coral reefs and coral reef ecosystems, through a wide variety of international treaties, organizations, initiatives and public-private partnerships.

<http://www.sdp.gov/sdp/initiative/icri>

### **WorldFish Center**

The WorldFish Center is an international, nonprofit research organization dedicated to reducing poverty and hunger by improving fisheries and aquaculture. WorldFish is one of 15 members of the Consortium of International Agricultural Research Centers supported by the Consultative Group on International Agricultural Research (CGIAR). The CGIAR is a global partnership that unites organizations engaged in research for sustainable development with the funders of this work. The funders include developing and industrialized country governments, foundations, and international and regional organizations. The WorldFish Center is committed to meeting two key development challenges: 1) improving the livelihoods of those who are especially poor and vulnerable in places where fisheries and aquaculture can make a difference, and 2) achieving large scale, environmentally sustainable increases in supply and access to fish at affordable prices for poor consumers in developing countries. WorldFish maintains FishBase ([www.fishbase.org](http://www.fishbase.org)), and ReefBase ([www.reefbase.org](http://www.reefbase.org)) and was instrumental in developing ReefBase Pacific ([www.pacific.reefbase.org](http://www.pacific.reefbase.org)) that was a major source of information for this report. WFC also maintains the GCRMN website ([www.gcrmn.org](http://www.gcrmn.org)).

<http://www.worldfishcenter.org>

### **The World Resources Institute (WRI)**

The World Resources Institute is an environmental think tank that goes beyond research to create practical ways to protect the earth and improve people's lives. WRI's work in coastal ecosystems includes the Reefs at Risk series, which uses geographic spatial analysis to model threats to coral reefs, as well as the Coastal Capital project, which supports sustainable management of coral reefs and mangroves by quantifying their economic value.

Reefs at Risk Revisited (2011) is the latest publication in WRI's Reefs at Risk series, which began in 1998 with the release of the first global analysis, Reefs at Risk: A Map-Based Indicator of Threat to the World's Coral Reefs, and was followed by two regional reports for Southeast Asia (2002) and the Caribbean (2004). Reefs at Risk Revisited is a high-resolution update of the original global report that draws upon the improved methodology of the regional studies, more detailed global data sets, and new developments in mapping technology and coral reef science. It was a multi-year, collaborative effort that involved more than 25 partner institutions.

The Reefs at Risk Revisited project consolidates global data sets into a geographic information system (GIS) to model threats to coral reefs and map where reefs are at greatest risk of degradation or loss. The threats examined include local threats from human activities (coastal development, land-based and marine-based pollution, and overfishing) and global threats from a changing climate (ocean warming and acidification). In the absence of complete global information on reef condition, this analysis represents a pragmatic hybrid of monitoring observa-

tions and modeled predictions of reef condition. Data and maps from the Reefs at Risk Revisited project are presented in the country profiles in Section 1 of this report.  
<http://www.wri.org/reefs> & <http://www.wri.org/project/reefs-at-risk>

### **WWF South Pacific**

Since 1995, WWF South Pacific has been working with governments and communities to support Pacific Island people in conserving and sustainably managing their natural inheritance for present and future generations. The WWF South Pacific program promotes the development and implementation of sound policies and strategies that lead to sustainable marine resource management and biodiversity conservation, and also empower key stakeholders to implement them effectively. WWF South Pacific has a shared vision of Supporting Pacific Island people to conserve and sustainably manage our natural inheritance for present and future generations. WWF South Pacific is managed from a regional base in Suva, Fiji, where conservation field projects, policy reviews, and campaigns are coordinated for many projects across the region. In 2004, WWF South Pacific had more than 100 staff.  
<http://www.wwfpacific.org.fj>

## Cover photographs

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THIERRY LISON DE LOMA is the associate Director of the Institute for the Coral Reefs of the Pacific (IRCP). He holds a PhD in Marine Environmental Sciences from the University of Aix-Marseille (France), with a focus on biogeochemistry and ecology in coral reefs. He started to work on coral reefs by studying coral ecology in 1993, in the tropical island of La Réunion (Indian Ocean). He is now a specialist in coral reef fish ecology in French Polynesia, based at CRIOBE (CRNS-EPHE) in Moorea. He mainly focuses on the effects of specific disturbances/factors (global change, fishing pressure and MPAs) on long-term fish community dynamics. For the past 19 years, Thierry has been diving extensively in the islands of the South Pacific and Indian Oceans (from Pitcairn to Madagascar), for field work and for his own enjoyment. He is in charge of the GCRMN Pacific Node.

KATIE REYSTAR is a Research Associate at the World Resources Institute. She is a co-author of WRI's *Reefs at Risk Revisited* report and specializes in GIS and data analysis. Katie has a M.E.S.M. in Coastal Marine Resources Management from the University of California, Santa Barbara and a B.S. in Environmental Engineering from the Johns Hopkins University.

SERGE PLANES has been involved in the study of population genetics of marine fish since the beginning of his career that started with his PhD in 1989. Over the past 20 years, he has published about 65 papers in international journals dealing with the population genetics of coral reef fishes and an additional 50 papers dealing with ecology, ecology of marine protected areas and recruitment of marine fishes. Such international recognition led to him being invited to participate as a member of the Australian Centre of Excellence on Coral Reefs and he has recently been incorporated into the scientific committee of the 12th International Coral Reef Symposium. Serge Planes is directing the LABEX "CORAIL" awarded in 2011 for 10 years, this being the major structural framework for research on coral reef ecology in France. He is also the Director of the Centre for Island Research and Observatory of the Environment (CRIOBE) and of the Institute for the Coral Reefs of the Pacific (IRCP), both based in Moorea, French Polynesia.

KARIN GERHARDT has a decade of experience in marine park management, specializing in the Great Barrier Reef. Her work at the Great Barrier Reef Marine Park Authority has included marine park management, permit assessment, policy development and impact assessment. One of Karin's specialties is in Knowledge Management – specifically the acquisition, management and effective utilization of knowledge and information for managing marine areas. Her expertise in this area was instrumental in managing the information processes that were used to develop this report. Her current focus is on working with the Traditional Owners of the Great Barrier Reef in the management of Sea Country and capturing and evaluating the outcomes of the Reef Rescue Land and Sea Country Indigenous Partnership Program.

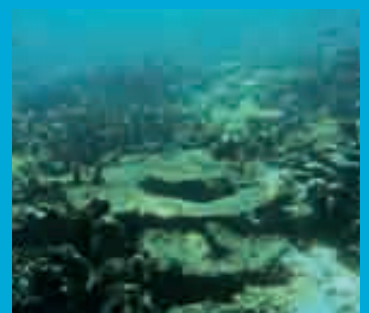
ERIC CLUA is a scientist based at the Secretariat of the Pacific Community (SPC Noumea, New Caledonia), where he is the coordinator of the Coral Reef Initiatives for the Pacific (CRISP) programme. Eric holds a PhD in Marine Ecology from the Practical School of High Studies (Ecole Pratique des Hautes Etudes – EPHE), Perpignan, France. His interest in coral reef ecology, conservation and sharks has taken him to many islands across the South Pacific. He has developed, over the years, an intimate knowledge of the Pacific region, its coral reefs and its peoples. His role in promoting the sustainable development of coral reef related activities in the Pacific has been crucial.

LAURETTA BURKE is a Senior Associate at the World Resources Institute. Lauretta leads WRI's work on coastal ecosystems, including the *Reefs at Risk* project and *Coastal Capital* series on valuation of coral reefs. She has an M.A. in Environment and Resource Policy from the George Washington University and an M.A. in Geography from the University of California, Santa Barbara.

CLIVE WILKINSON has been the Coordinator of the Global Coral Reef Monitoring Network since 1996. He was formerly the Chief Technical Advisor for a coastal resource research program in 5 ASEAN countries and for an Australian project in Thailand after the massive tsunami of December 2004. He was an active field scientist on the ecology of the Great Barrier Reef at the Australian Institute of Marine Science with more than 100 papers published. He received BSc and PhD training in marine microbiology and ecology from the University of Queensland. He is based with the Reef and Rainforest Research Centre in Townsville Australia and now provides advice to governments on effects of global climate change on coastal ecosystems and potential adaptation policies.



**SPC**  
Secretariat  
of the Pacific  
Community



The World Bank



Australian Government  
Great Barrier Reef  
Marine Park Authority