

# State of conservation in **Fiji**

## COUNTRY REPORT

2013



### SPREP Library Cataloguing-in-Publication Data

State of conservation in Fiji : country report 2013.

Apia, Samoa : SPREP, 2016.

p. cm.

ISBN: 978-982-04-0631-5 (print)

978-982-04-0632-2 (e-copy)

1. Environmental policy – Fiji. 2. Environmental protection – Fiji. 3. Conservation of natural resources– Fiji. I. Pacific Regional Environment Programme (SPREP). II. Title. 333.729611

Copyright © Secretariat of the Pacific Regional Environment Programme (SPREP), 2016

Reproduction for educational or other non-commercial purposes is authorised without prior written permission from the copyright holder provided that the source is fully acknowledged. Reproduction of this publication for resale or other commercial purposes is prohibited without prior written consent of the copyright owner.

The design and layout of this report is funded by the Pacific Ecosystem-based Adaptation to Climate Change Project (PEBACC). PEBACC is a five year project implemented by the Secretariat of the Pacific Regional Environment Programme (SPREP) in partnership with the governments of Fiji, Solomon Islands and Vanuatu. The Project focusses on strengthening and protecting the role of natural ecosystem services to enhance resilience to climate change. The project is part of the International Climate Initiative (IKI). The German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) supports this initiative on the basis of a decision adopted by the German Bundestag.



Supported by:



Federal Ministry for the  
Environment, Nature Conservation,  
Building and Nuclear Safety

based on a decision of the German Bundestag

Secretariat of the Pacific Regional Environment Programme (SPREP)

PO Box 240

Apia, Samoa

[sprep@sprep.org](mailto:sprep@sprep.org)

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

Our vision: The Pacific environment, sustaining our livelihoods and natural heritage in harmony with our cultures.



# State of conservation in **Fiji**

## COUNTRY REPORT 2013





River delta, Vanua Levu, Fiji  
Image credit: Stuart Chape



# About this assessment

For the Ninth Pacific Islands Conference on Nature Conservation and Protected Areas December 2013, the Secretariat of the Pacific Regional Environment Programme (SPREP) commissioned an assessment of the status of biodiversity and conservation in Oceania. For the purposes of this report, Oceania refers to the 21 countries and territories of the SPREP region. Pitcairn Island is also included in many analyses because the UK is a member of SPREP, although Pitcairn is not formally included as a SPREP territory. The assessment was produced as a comprehensive report, *State of Conservation in Oceania 2013*, along with separate individual country assessments for the countries and territories of the Pacific Regional Environment Programme region.

This Fiji country assessment provides key findings for Fiji that contributed to developing the comprehensive State of Conservation in Oceania 2013 report.

This report assesses the overall state of conservation in Fiji using 16 indicators. The indicators provide information not only about the state of conservation in Fiji but also about what pressures and threats conservation in Fiji is facing and what action is being taken to halt further loss or degradation and improve its long-term sustainability.

Each indicator aims to provide a measure of the current situation and indicate whether it is getting better or worse. Because the amount and quality of available information varies among indicators, a measure of confidence in the data is also provided.

## Approach to reporting on the key findings from the review of the state of conservation in Fiji

The assessment is structured in two related parts:

- **State, pressures and threats** considers the current health of key habitat types and resources across Fiji as well as the factors and drivers of environmental change affecting Fiji biodiversity.
- **Response** details action being taken to improve the health and sustainability of Fiji biodiversity considering two key aspects: Environmental Governance and Conservation Initiatives.

In each case, a mixture of habitat-related (such as forest or mangroves) and biodiversity-related (such as threatened species) indicators have been used to present a picture of how biodiversity is threatened and where action is needed to protect it.



The indicators encompass:

### Ecosystems

- Terrestrial ecosystems status and rates of change of forest cover
- Freshwater ecosystems – status and threats to rivers, lakes and wetlands
- Coastal ecosystems – status and threats to mangroves, seagrasses and coral reefs
- Marine ecosystems status and threats to ocean health and utilised species

### Species

- Threatened species – distribution, status and extinction risk of IUCN Red Listed species
- Endemic species – status and threats
- Migratory marine species of conservation concern – status and threats to marine turtles, cetaceans and dugongs

### Response

- **Environmental governance:**
  - Ratification and implementation of Multilateral Environment Agreements (MEAs)
  - National policies and legislation relating to MEAs and biodiversity laws
  - National Biodiversity Strategy and Action Plans (NBSAPs) and other reports to the Convention on Biological Diversity
  - Traditional governance of land and marine resources
- **Conservation initiatives:**
  - Establishment of protected areas for the preservation of ecosystems and species, including Alliance for Zero Extinction Sites, Important Bird Areas, Key Biodiversity Areas, ecologically or biologically significant marine areas
  - Protected Area coverage and invasive alien species management.

Each indicator aims to provide a measure of the current situation and demonstrate whether it is getting better or worse. Because the amount and quality of available information varies among the indicators, a measure of confidence in the data is also provided.

## Status

Using each indicator, an attempt is made to summarise and quantify the present situation with respect to the status of species and ecosystems.

For **STATE**, the current condition of biodiversity, habitats and ecosystems is rated from GOOD to FAIR to POOR.

For **PRESSURES**, the assessed level of threat is rated from GOOD (minimal threat) to FAIR to POOR (high threat).

For **RESPONSES**, the assessed level and effectiveness of actions to protect and safeguard biodiversity, habits and ecosystems is rated from GOOD to FAIR to POOR.

## Trend

For each indicator, trends were examined in order to assess whether things are getting better or worse or staying about the same. For some indicators, there was insufficient information to judge the trend or even to determine the current state at the regional level.

**MIXED:** Some aspects have improved, and some have worsened

**DETERIORATING:** The state of biodiversity related to this indicator has worsened

**IMPROVING:** The state of biodiversity related to this indicator has improved

**UNDETERMINED or UNKNOWN:** Not enough information was available to determine a baseline.

## Data confidence

The amount and quality of data available for assessing any trends were examined. The quality, quantity and reliability of data varied due to a number of factors—for example, by country, by species or by ecosystem. This term allowed a measurement of the level of data confidence.

**High:** A large amount of recent data available

**Medium:** A moderate amount of recent and relatively recent data available

**Figure i** Interpreting the indicator icons

**Status** is represented by colour:

POOR = red

FAIR = yellow

GOOD = green

**Trend** is indicated by the direction of one or two arrows:

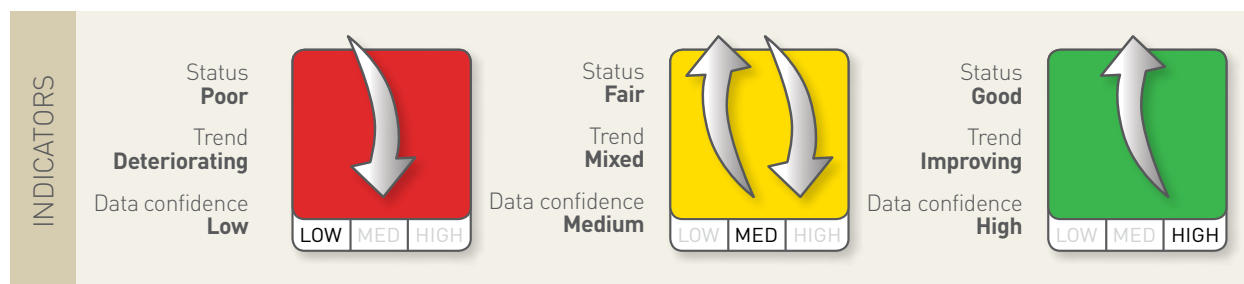
DETERIORATING = downward

MIXED = one upward, one downward

IMPROVING = upward

**Data confidence** is indicated by a highlighted word:

LOW, MED (medium) or HIGH



**Low:** Not enough information was available to determine a baseline

The progress toward meeting the Aichi Convention on Biological Diversity 2020 Goals and Targets is assessed here at the regional level for each indicator, in addition to assessing whether or not current measures provide an adequate level of protection for the species and ecosystems in question.

# Contents

About this assessment ..... iii

Key acronyms ..... 2

Introduction: Country ..... 3

## STATE, PRESSURES AND THREATS .7

### 1. Ecosystems ..... 8

- 1.1 Terrestrial ecosystems – Forest cover 8
- 1.2 Freshwater ecosystems ..... 11
- 1.3 Coastal ecosystems ..... 13
- 1.4 Marine ecosystems ..... 21

### 2. Native species ..... 28

- Marine and coastal species ..... 28
- 2.1 Threatened species ..... 29
- 2.2 Endemic species ..... 32
- 2.3 Threatened migratory marine species ..... 34

## RESPONSE .....39

### 3. Environmental governance ..... 40

- 3.1 Multilateral Environment Agreements ..... 40
- 3.2 National policies and legislation ..... 42
- 3.3 Traditional governance ..... 42
- 3.4 National Biodiversity Strategy and Action Plans and National reporting to the Convention on Biological Diversity ..... 44

### 4. Conservation initiatives ..... 46

- 4.1 Protected areas ..... 46
- 4.2 Conservation initiatives ..... 55

## ADDENDA .....59

### 5. Summary and conclusions ..... 60

### Bibliography ..... 63

**Appendix A:** Ratification of International Conventions and related regional and national frameworks, policies and legislation in Fiji ..... 68

**Appendix B:** National Governance – Governance of terrestrial and marine ecosystems ..... 70

**Appendix C:** Legislation addressing key threats to habitats in Fiji ..... 71

**Appendix D:** Non-governmental conservation initiatives in Fiji ..... 73

**Appendix E:** Legislation in Fiji relating to species conservation – legal frameworks, institutional arrangements and strategies in place related to species conservation ..... 75



## Index of tables

|          |   |    |
|----------|---|----|
| Table 1  | Key geographic statistics for Fiji .....  | 3  |
| Table 2  | Summary of population and economic factors for Fiji .....   | 5  |
| Table 3  | Extent of terrestrial ecosystems in Fiji .....  | 10 |
| Table 4  | Change in forest cover over time in Fiji .....  | 10 |
| Table 5  | State of Fiji's coral reefs .....   | 15 |
| Table 6  | Estimates of change in mangrove area in Fiji in response to relative sea level change under climate change predictions for countries with mangroves, including Fiji ..... | 18 |
| Table 7  | Species of seagrass found in Fiji ...   | 19 |
| Table 8  | Pacific Climate Change Science Program Countries Report .....   | 23 |
| Table 9  | Fiji species included on the IUCN Red List (version 2013.1) .....   | 31 |
| Table 10 | Threats faced by extant IUCN Red Listed threatened species (CR, EN, VU) in Fiji (excluding Cnidaria species) .....  | 32 |
| Table 11 | Total number and percentage of extant IUCN Red List single-country endemic species in Fiji affected by each threat type with relative ranking given .....                 | 33 |
| Table 12 | Marine species of conservation concern in Fiji .....  | 36 |
| Table 13 | Fiji and Multilateral Environmental Agreements (MEAs) .....   | 41 |
| Table 14 | Summary of reporting by Fiji to the CBD up to 2013 .....  | 45 |
| Table 15 | Protected Area coverage in Fiji .....   | 46 |
| Table 16 | Protected marine and terrestrial areas in Fiji .....  | 47 |
| Table 17 | Important Bird Areas in Fiji and % of area protected (Integrated Biodiversity Assessment Tool (IBAT) 2013) .....  | 50 |
| Table 18 | Endemic bird species in the Rotuma Island EBA .....   | 51 |
| Table 19 | AZEs in Fiji and % of area protected (Integrated Biodiversity Assessment Tool (IBAT) 2013) .....  | 52 |
| Table 20 | Key Biodiversity Areas in Fiji .....  | 53 |
| Table 21 | Ecologically or Biologically Significant Areas (EBSAs) in Fiji .....  | 54 |
| Table 22 | Protected Area coverage of AZEs in Fiji .....   | 54 |
| Table 23 | Protected Area coverage of Key Biodiversity Areas (KBAs) in Fiji ....   | 54 |
| Table 24 | Summary of indicator assessments for Fiji .....   | 60 |
| Table 25 | Mapping of AICHI biodiversity targets with indicators in this assessment .....  | 61 |

## Index of figures

|          |  |    |
|----------|--|----|
| Figure i | Interpreting the indicator icons .....   | v  |
| Figure 1 | Map of Fiji .....  | 4  |
| Figure 2 | Monitoring of Fiji's reefs .....   | 15 |
| Figure 3 | Number of assessed species in each category .....  | 30 |
| Figure 4 | Assessed threats to migratory marine species in Fiji based on MTSG data for the Pacific South Central RMU for the green turtle and hawksbill turtle, and Pacific West for the leatherback turtle and mean values for cetaceans based IUCN Red List 2008 global species assessments ..... | 37 |



# Key acronyms

| ACRONYM  | DEFINITION  |
|----------|---|
| AFD      | Agence Française de Développement   |
| AUSAID   | Australia Aid   |
| CBD      | Convention on Biological Diversity  |
| CCCPIR   | Coping with Climate Change in the Pacific Island Region   |
| CITES    | Convention on International Trade in Endangered Species of Wild Fauna and Flora   |
| CMS      | Convention on the Conservation of Migratory Species of Wild Animals   |
| FAO      | Food and Agriculture Organization   |
| GEF      | Global Environment Facility   |
| GIZ      | Deutsche Gesellschaft für Internationale Zusammenarbeit   |
| IOSEA    | Indian Ocean South East Asia (Marine Turtle MoU)  |
| IUCN     | International Union for Conservation of Nature  |
| MEA      | Multilateral Environmental Agreement  |
| MoU      | Memorandum of Understanding   |
| NBSAP    | National Biodiversity Strategy and Action Plan  |
| NGO      | Non-Governmental Organization   |
| PACC     | Pacific Adaptation to Climate Change  |
| PAS      | Pacific Alliance for Sustainability   |
| PIGGAREP | Pacific Islands Greenhouse Gas Abatement through Renewable Energy project   |
| Ramsar   | Convention on Wetlands of International Importance  |
| SPC      | Secretariat of the Pacific Community  |
| SPREP    | Secretariat of the Pacific Regional Environment Programme   |
| UNCCD    | United Nations Convention to Combat Desertification   |
| UNCLOS   | United Nations Convention on Law of the Sea   |
| UNDP     | United Nations Development Program  |
| UNEP     | United Nations Environment Programme  |
| UNFCCC   | United Nations Framework Convention on Climate Change   |
| USP      | University of the South Pacific   |
| WCPFC    | Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean |
| WHC      | World Heritage Convention   |

# Introduction: Fiji

The Fijian archipelago (Figure 1) has an estimated land area of 18,500 square kilometres, consisting of more than 320 islands and over 500 islets and cays, with approximately 100 of these being inhabited. The two largest islands of Viti Levu and Vanua Levu comprise more than 85% of Fiji's total land area and account for 87% of the estimated 2012 population of 860,000. The capital and largest city, Suva, is on Viti Levu. About three-quarters of Fijians live on Viti Levu's coasts, either in Suva or in other major urban centres like Nadi or Lautoka or in smaller towns. Viti Levu's interior is sparsely inhabited due to its terrain.

**Table 1** Key geographic statistics for Fiji

| Geographic feature       | Size   | Unit            |
|--------------------------|--------|-----------------|
| Land area                | 18,575 | km <sup>2</sup> |
| Agricultural land (2011) | 4,276  | km <sup>2</sup> |
| Coastline                | 1,129  | km              |
| Territorial sea          | 12     | nautical miles  |
| Exclusive Economic Zone  | 200    | nautical miles  |

## Economy

Endowed with forest, mineral and fish resources, Fiji is one of the most developed of the Pacific island economies, although it remains a developing country with a large subsistence agriculture sector. Agriculture accounts for 18% of gross domestic product, although it employed some 70% of the workforce as of 2001. Sugar exports and the growing tourist industry are the major sources of foreign exchange. Sugar-cane processing makes up one-third of industrial activity. Coconuts, ginger and copra are also significant (see Table 2).

Approximately 87% of the land in Fiji is customary owned land and is owned communally by the Mataqali, which is the land-owning unit. Such ownership is recognised by the Constitution of the Republic of Fiji. Customary rights of access to Mataqali fishing areas and land for communal use is recognised by the Fisheries Act and the Forest Decree.

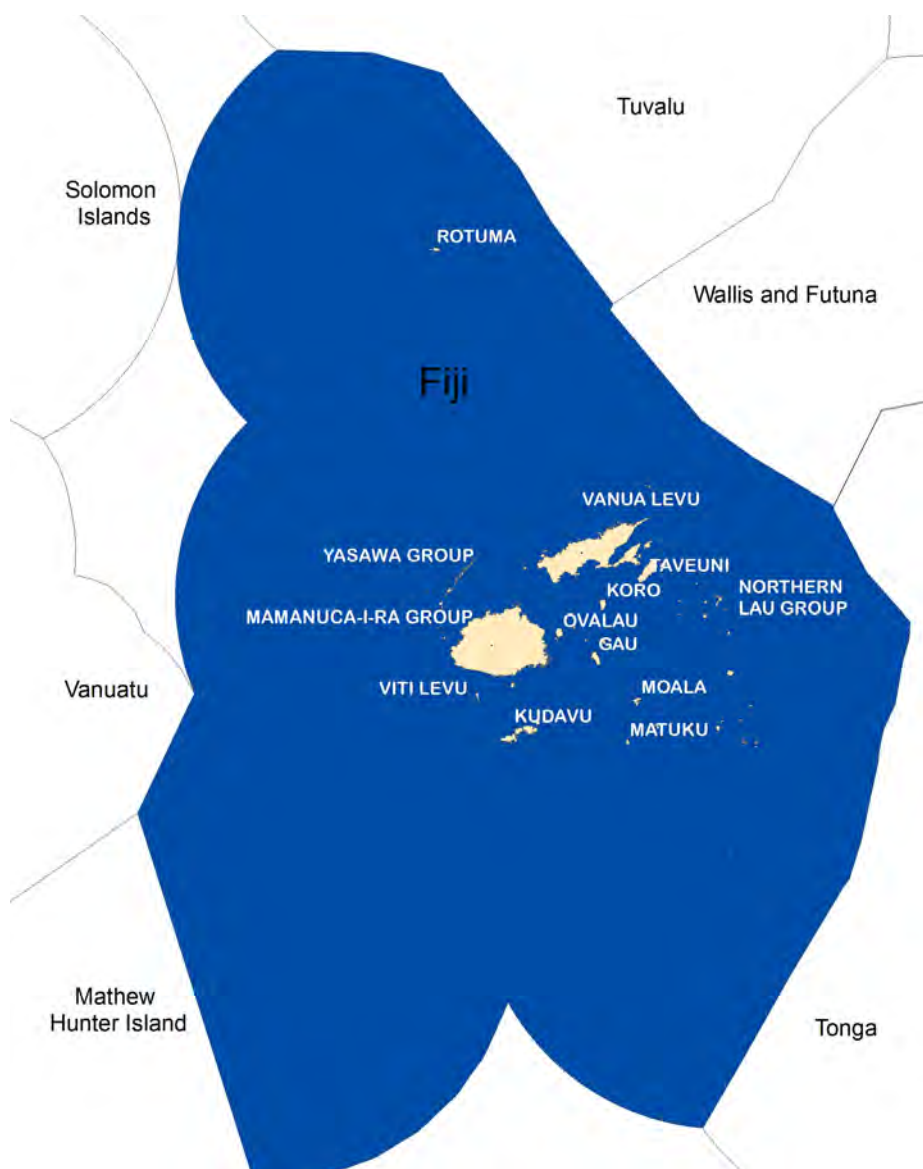
## Environmental issues

Achieving sustainable development, while overcoming environmental challenges such as deforestation, land degradation, logging of watersheds, over-exploitation of terrestrial and aquatic biological resources, improper waste management and pollution control, impact of climate change and the attitude of people in terms of the unsustainable use of their resources, is a central challenge to governments of small island states such as Fiji. Increasing population, urbanisation, industrial, agricultural and other economic development have placed increasing pressure on coastal zones, leading to loss of habitat and affecting ecological processes. This pressure is a result of coastal development, pollution and increased water demand from freshwater lenses; over-exploitation of resources; and other related issues. The absence of consistent monitoring of development within coastal zones makes it difficult to assess the extent and seriousness of damage and degradation in coastal zones of Fiji.

The discharge of untreated or inadequately treated wastewater from the industrial and agricultural sectors as well as increased sewage discharge causes harmful effects on the environment and on human health. The impacts of this discharge result in changes to the ecosystems, reduction in economic value of resources and aesthetic damage and pose human-health risks. Contaminants of concern that are present in wastewater include



Figure 1 Map of Fiji



pathogens (micro-organisms), nutrients, heavy metals, hazardous chemicals, suspended solids, and oil and grease.

The major environmental problems include deforestation, land degradation, air and water pollution, inappropriate refuse disposal, climate change and sea-level rise, outdated

legislation and its inadequate enforcement, and limited public awareness. It is hoped that the implementation of the Environment Management Act and related programmes, as well as allocation of adequate resources, will assist in addressing some of these issues.

Table 2 Summary of population and economic factors for Fiji

| Factor   | Value  | Year |
|--|--|------|
| Population                                     | 897,000  | 2013 |
| Population growth rate                         | 0.73%  | 2013 |
| Labour force                                   | 335,000  | 2007 |
| Unemployment rate                              | 8.60%  | 2007 |
| Employment by sector                           |  |      |
| Agriculture                                    | 70%  |      |
| Industry and services                          | 30%  |      |
| Export commodities                             | Sugar, garments, gold, timber, fish, molasses, coconut oil |      |
| International tourism arrivals                 | 675,000  | 2011 |
| Yearly tourist arrivals to residents ratio     | 76.40%   | 2011 |
| GDP growth rate                                | 2%   | 2012 |
| Inflation rate                                 | 5.00%  | 2012 |
| GDP per capita (Purchasing Power Parity [PPP]) | USD 4,900  | 2012 |
| GDP by sector                                  |  |      |
| Agriculture                                    | 11.70%   |      |
| Industry                                       | 18.10%   |      |
| Services                                       | 70.20%   |      |





Clown fish at Two Thumbs reef, Namena Island, Fiji  
Photo credit: Sangeeta Mangubhai.

## STATE, PRESSURES AND THREATS

|                  |    |
|------------------|----|
| 1 Ecosystems     | 8  |
| 2 Native species | 28 |

The many and significant pressures and threats impacting the biodiversity of Oceania undoubtedly have a serious impact on many terrestrial, freshwater and marine ecosystems and species.

There is an urgent need to take stock of the current state of natural systems and resources, so the greatest risks can be identified and mitigation and recovery actions can be developed.

The greatest current threats to biodiversity conservation result from human activities: habitat loss; invasive alien species; urban, agricultural and industrial pollution; and over-exploitation. The direct effects of climate change in combination with these major threats will only exacerbate the risks to biodiversity. Pressures work singly or in tandem with each other in complex ways, and the magnitude of each pressure varies from country to country.

This section looks at the current state of the region's natural systems and the species that inhabit those systems as well as the impact of pressures and threats acting upon them.

# 1 Ecosystems

## 1.1 Terrestrial ecosystems – Forest cover

### Key points

- Most countries and territories of Oceania have relatively high forest cover, with an average of 61% of land area covered in forest in 2010, higher than the global average of 31%.
- Across Oceania, the 0.4% of forest cover area lost per year between 2005 and 2010 is significantly higher than the global deforestation average for the same period of 0.14%. Most of the loss in Oceania is accounted for by Papua New Guinea.
- Rates of deforestation vary widely across the countries and territories of the SPREP region, but they have risen in the larger countries, such as the Solomon Islands and Papua New Guinea, in recent years.
- Forest habitat loss in the Pacific is mostly due to economic activities, such as logging and agriculture, and to a lesser extent to mining and infrastructure development, such as roads and settlements. Forest degradation is also caused by natural disasters, such as cyclones and fire, and the spread of invasive species.
- Future projected increases in the human population are likely to intensify pressure on the Pacific's forest resources. Climate change is also expected to have a significant, but as yet unpredictable, impact on the health, vitality and biodiversity of Pacific forests.
- Most countries only have low percentages of their land area protected.

### Background and relevance of indicator

This indicator considers the extent of terrestrial ecosystems in Fiji. It measures the rates of forest cover change and identifies key pressures and threats to forest cover.

Forest is defined as land areas more than 0.5 hectares with trees more than 5 metres high and/or canopy cover of more than 10%. Forest habitat conversion and loss directly impoverish biodiversity and may facilitate other pressures, such as the influx of weeds and browsing animals, increased soil erosion, reduced water quality and the sedimentation of lagoon areas.

### How the indicator was assessed

Data for this indicator come primarily from the FAO Forest Resource Assessment, the most comprehensive five to ten yearly global assessment of forest status and trends. However, there is variability in the completeness and currency of data provided by countries on their forest resources. Other reports and literature consulted include the report by Olson et al. (2009).

### State

Fiji contains diverse ecosystems, including significant areas of natural forest. The country's bio-geographical history has given rise to an exceptionally diverse forest biota characterised by high levels of endemism at both species and higher taxa levels (Heads 2006, cited by Olson et al. 2009). Major habitat types on each of the major islands (Viti Levu, Vanua Levu, Taveuni, Kadavu and Gau) and island groups (Mamanuca, Yasawa, Lau and Lomaiviti Groups, and Rotuma) include:

- cloud forests: on the top of higher mountains (Ash 1992 cited by Olson et al. 2009);



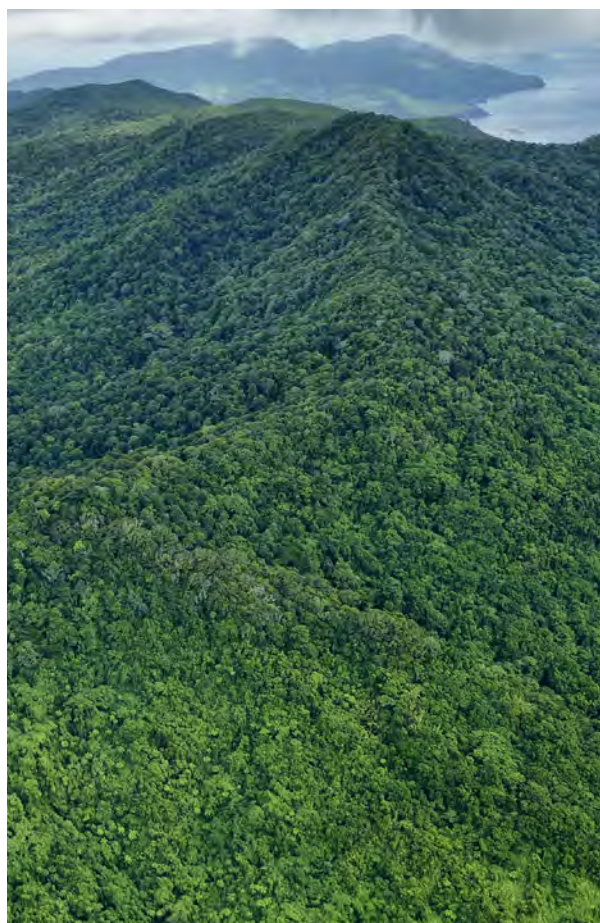
- montane forests: between 600 and 800 metres;
- lowland moist forests: 0–600 metres;
- transition forests between the wet and dry sides of the larger islands; and
- tropical dry forests (Olson et al. 2009).

Coastal littoral forest (CLF) is found along beaches and supratidal coastal areas, inner margins of mangroves and small, uninhabited offshore islands. This forest type comprises drought- and salt-tolerant ocean-dispersed plants and is one of the most highly threatened ecosystems in Fiji. CLF provide critical ecosystem services such as protection from erosion, salt spray and king tides and are habitats and breeding areas for seabirds, migratory birds, sea turtles and land and shore crabs.

Although there are no reliable statistics, the area and species diversity of CLF have decreased significantly in Fiji over the past century or more, and increasing numbers of formerly common coastal trees are threatened with local extinction (extirpation), have decreased abundance and require protection and replanting.

Threatened coastal trees in Fiji include:

- vesi (merbau, *Intsia bijuga*), which has disappeared from coastal and limestone forest due to overexploitation on many islands;
- drala (coral tree or dadap *Erythrina variegata* var. *variegata*), an important nitrogen fixing and cultural tree, that has disappeared in Fiji over the past decade due to infestation by an African wasp;
- mulomulo (Portia or thespians tree, *Thespesia populnea*), which has disappeared due to the clearance along the inner margins of mangroves and overuse for medicine and woodcarving; and
- bird-catcher or lettuce tree (*Pisonia grandis*), the most important seabird rookery species, which is threatened or has disappeared from many islands.



Forest on Natewa Peninsula, Vanua Levu, Fiji.

Photo credit: Stuart Chape.

## Pressures and threats

It is estimated that 140,000 hectares of Fiji's native forests have been converted to non-forest land-use since 1967 (see Table 3). The four main causes of this conversion include forest clearance for commercial agriculture and rural development projects; commercial and subsistence farming; growth of small settlements and urban areas; and infrastructure development such as roads to service settlements.

Recent trends indicate an increase in overall forest cover in Fiji from 52% of land mass in 1990 to 56% of land area in 2010 (Food and Agriculture Organisation of the United Nations (FAO) 2010) (see Table 4), reflecting the increase in plantation forestry (primarily pine and mahogany), which now composes 11% of the forest area of Fiji (Government of Fiji 2010). The increase in plantation forests was associated with a 9% decline in primary forest cover from

Table 3 Extent of terrestrial ecosystems in Fiji

| Country/area | Land area |                |                   |                |                       |                                 | Inland water<br>(1,000 ha) | Country area<br>(1,000 ha) |
|--------------|-----------|----------------|-------------------|----------------|-----------------------|---------------------------------|----------------------------|----------------------------|
|              | Forest    |                | Other wooded land |                | Other land (1,000 ha) |                                 |                            |                            |
|              | 1,000 ha  | % of land area | 1,000 ha          | % of land area | Total                 | Amount of which with tree cover |                            |                            |
| Fiji         | 1,014     | 56             | 78                | 4              | 735                   | 66                              | 0                          | 1,827                      |
| Oceania      | 33,816    | 61             | 5,553             | 10             | 14,725                | 306                             | 1,157                      | 55,248                     |
| World        | 4,033,060 | 31             | 1,144,687         | 9              | 7,832,762             | 79,110                          | 423,723                    | 13,434,232                 |

Table 4 Change in forest cover over time in Fiji

| Country | Areas in 1,000 ha |                  |               |                  |               |                  |               |                  |               | Forest change |             |             |
|---------|-------------------|------------------|---------------|------------------|---------------|------------------|---------------|------------------|---------------|---------------|-------------|-------------|
|         | Land area         | 1990 Forest area | 1990 Forest % | 2000 Forest area | 2000 Forest % | 2005 Forest area | 2005 Forest % | 2010 Forest area | 2010 Forest % | 1990–2000 %   | 2000–2005 % | 2005–2010 % |
| Fiji    | 1,827             | 953              | 52            | 980              | 54            | 997              | 55            | 1,014            | 56            | 0.29          | 0.34        | 0.34        |
| Oceania | 55,248            | 36,470           | 66            | 35,197           | 64            | 34,514           | 62            | 33,816           | 61            | -0.35         | -0.19       | -0.20       |
| World   |                   |                  |               |                  |               |                  |               |                  |               | -0.20         | -0.12       | -0.14       |

490,000 hectares in 1990 to 449,000 hectares in 2010.

This trend is continuing with ongoing clearance of primary forests. There has been a loss of certain forest types, some of which were once extensive in Fiji (Government of Fiji 2010). Fiji's remaining native forest is now mainly confined to areas of high rainfall and elevation and steep slopes, with much of the accessible lowland forest cleared by loggers and converted to plantations, the exploitation of forests for timber playing a major role in deforestation and significantly affecting forest quality and diversity (Government of Fiji 2010). Primary forests in Fiji are also threatened by expansion of hydropower and large-scale mining.

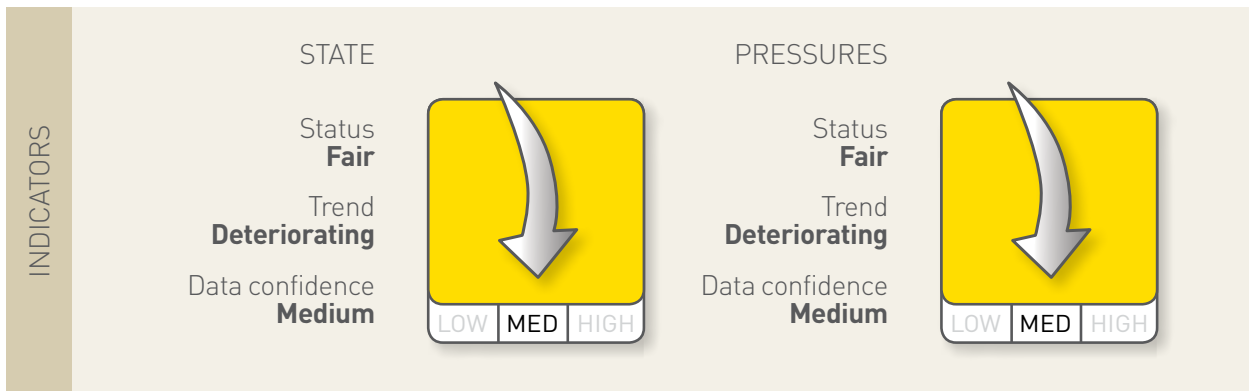
Loss of forest cover has important ramifications for terrestrial ecosystems. The first relates to biodiversity because loss of habitat is a major cause of species loss and extinction. The second relates to the impacts of land clearance in increasing erosion, which has flow-on effects on freshwater and coastal ecosystems as a result of siltation and sedimentation. Furthermore, land-use change toward agriculture increases

agricultural pollution and nutrient levels in freshwater and marine ecosystems.

The major causes of loss of coastal and littoral forests include:

- overexploitation and felling of useful trees for construction, woodcarving, fuel, medicines and other uses;
- rapid urbanisation and expansion of settlement;
- conversion of coastal areas to agriculture (sugarcane), aquaculture and tourism;
- invasive alien species, including goats, pigs, rats, ants and weeds, such as *Wedelia* (*Sphagneticola trilobata*). Listed as one of the '100 of the World's Worst Invasive Alien Species, *Wedelia* has spread to beaches on most islands and is found along riverbanks to elevations of 700 metres. It has invaded Sigatoka Sand Dunes National Park and other conservation areas; and
- failure to replant trees after cyclones and other extreme event or natural causes.





Labasa River estuary, Fiji  
Photo credit: Stuart Chape.

still needed for generating adequate water-resource assessments.

- Assessment of inland wetlands in Oceania shows a reduction from 36 million to 28 million hectares between 1999 and 2004.
- Owing to ecological connectivity, cloud forest, riparian forest, groundwater systems and subterranean flows, forest, agricultural wetlands and estuaries are considered of critical importance for freshwater wetland management, and a 'mountain to the sea' approach to monitoring is required.
- Threats affecting river, lake and wetland systems are increasing rapidly and are already leading to reduced freshwater species richness (from flow alteration, barriers, habitat and water-quality degradation, introduction of invasive species and overharvesting).
- The cumulative effects of these threats are exacerbating the risk of extinctions, with several endemic fish species reported in the IUCN Red List as threatened, and are compromising the sustainable use of freshwater ecosystems by local communities.

## 1.2 Freshwater ecosystems

### Key points

- Some of the most isolated and inaccessible freshwater lakes in the world are in Oceania. Most of these lakes infill old volcanic craters.
- Oceania rivers contain high levels of endemic species, and these species exhibit behaviours and life-history traits that are fostered by a number of environmental factors, such as unmodified flows, free passage, natural vegetation cover, quality estuaries or the absence of introduced species.
- Freshwater ecosystem baseline assessment, mapping and classification is lacking. In many islands, more and better meteorological, hydrological, hydrogeological and water-quality data are being gathered, but more is

### Background and relevance of indicator

Maintenance of freshwater and wetland ecosystems is vital for Oceania because many of these systems provide an important contribution to ecosystem services and subsistence livelihoods, especially river systems. On the larger volcanic islands, there are significant areas of riverine (rivers), lacustrine (lakes, ponds) and palustrine (non-tidal wetlands) habitats. The smaller atoll countries and territories of Oceania generally have few, if any, wetlands other than reef systems, although

there may be small areas of mangrove or *Pandanus* swamp. Freshwater resources on atolls and coral and limestone islands are generally limited to groundwater. Nauru, Niue, Kiribati, Tonga, Tuvalu and the Republic of the Marshall Islands have no significant surface water resources.

This indicator assesses the threats to river, lake and wetland ecosystems. Availability and reliability of water resources limit economic and social development, especially in countries that rely almost entirely on a single source of supply, such as groundwater (Kiribati), rainwater (Tuvalu, northern Cook Islands), surface reservoirs, or rivers and other surface flows.

## How the indicator was assessed

Threat assessments and other relevant information were sourced from recent reviews, reports and scientific publications (Cushing et al. 1995, Abell et al. 2007, Govan 2009, Govan et al. 2009, Schabetsberger et al. 2009, Jenkins et al. 2010, Secretariat of the Pacific Regional Environmental Programme (SPREP) 2011, Gehrke et al. 2012, International Union for Conservation of Nature (IUCN) 2012, Keith et al. 2013).

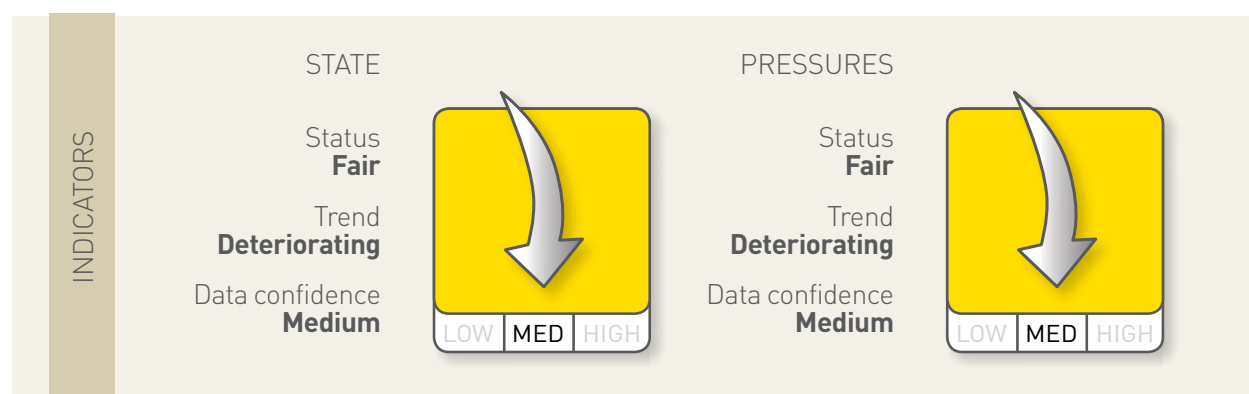
## State

Fiji comprises a group of high islands of volcanic origin, with barrier reefs, atolls, sand cays and raised coral islands. The larger islands are well watered by rivers and streams. Viti Levu alone is drained by five large rivers (the Rewa, Navua, Sigatoka, Nadi and Ba rivers), and on Vanua Levu, there are several short rivers, with the Dreketi River the largest at 55 kilometres long.

There are four main types of freshwater ecosystems in Fiji: rivers, creeks, peat swamps and lakes. Most of these are on the two main high islands, and the largest peat swamp is Bonatua (870 hectares) in Viti Levu. The freshwater lakes are generally restricted to mountainous regions, with the largest lake being Lake Tagimaucia located on Taveuni Island, covering 213 hectares. Fiji's streams and rivers are highly variable in size and length (Boseto 2006). On the larger islands, many short coastal streams have very small catchment areas and few side-branches. Further inland, many streams are branches of much larger systems with collective catchments covering thousands of hectares. On some of the smaller steep-sided islands, such as Taveuni, the streams are short and unbranched and also relatively steep, often being interrupted by high waterfalls that may act as barriers to fish dispersal.

Other freshwater systems include constructed reservoirs. In Viti Levu, there are two major dams: Vaturu Dam (160 hectares), which provides water for the western division of Viti Levu, and the larger Monasavu Dam (670 hectares), which provides water and hydro-electricity for the whole island of Viti Levu. A new dam (80 hectares) has been built at Wainikavika Creek near Navua to provide water for rice irrigation. The Fiji Water authority is also proposing to build a dam in the Sovi Basin to supply water to the Suva-Nausori area.

Also of concern to landowners and conservation stakeholders in Fiji and to the international conservation community are actions by the Namosi Joint Venture, which has unilaterally attempted to redefine the boundary of the Sovi Basin Conservation Area, confining it to the upper reaches of the Sovi River and excluding



the Wainavadu Creek catchment, which they wish to convert to a tailings dam for mine waste.

The nature of the catchments is also variable. Many have been deforested and repeatedly burned and grazed, others have been over-planted with exotic trees such as pine (*Pinus* sp.) and mahogany (*Swietenia macrophylla*), yet in a few cases, the indigenous forest of the catchments has been largely left intact. Many streams drain from limestone and sedimentary rocks, while others drain from acidic volcanic rocks.

Freshwater streams provide a wide range of microhabitats for fishes and other freshwater fauna: fast-flowing habitats, slow-flowing zones as well as deep and shallow zones. Freshwater fish biodiversity can be highly localised, and even small lake or stream systems may harbour unique locally evolved forms of life. The numbers of different species in any given freshwater habitat can be high even if the population numbers of the individual species are low.

## Pressures and threats

Similar to many other Pacific Island countries, threats to freshwater ecosystems are due to human activities such as poor land-use practices as a result of logging, burning and mining; catchment alteration primarily for irrigation, weirs or hydropower dams; pollution from urban areas, industry and mines; and invasion of exotic species such as water hyacinth (*Eichhornia crassipes*) and tilapia (*Oreochromis mossambica*), the introduced fish species.

Poor agricultural and mining practices often result in loss of riparian habitat, erosion of soil and increased turbidity, which may disrupt feeding success of fishes. Dams or weirs reduce or block flow to the extent that lower reaches of waterways can no longer support aquatic life. They also impede access to migratory species such as eels and amphidromous species that migrate between fresh- and salt-water habitats, which lose their migratory paths and cannot complete their life cycles.

Around urban centres, untreated industrial chemicals from increased agricultural practices are often washed into the water by heavy

rainfall. These pollutants pose a major threat by significantly altering the chemical and biophysical characteristics of the water, making the habitat non-conductive to aquatic life. Other threats to freshwaters include habitat loss due to land reclamation, overfishing and the aquarium trade. Loss of fish habitat through development can cause a major loss to the biodiversity of the local area that has been affected.

Most recent work has confirmed the importance of good riparian management, forest cover and fish passage. Jupiter et al. (2012) have convincingly demonstrated that the factors most strongly related to fish presence/absence and abundance are sub-catchment forest cover; conductivity; and the presence of downstream overhanging culverts.

## 1.3 Coastal ecosystems

### 1.3.1 Coral reefs

#### Key points

- Coral reefs are vital to land protection and food security across Oceania. There are over 650,000 square kilometres of coral reefs within the Pacific. More than 60% of them are now at risk of environmental damage.
- Reefs are vulnerable to elevated sea temperature and acidity, cyclones, predation (crown-of-thorns starfish, *Drupella* snails, etc.) and disease, increased water turbidity, overfishing and pollution as well as physical breakage from coastal developments.
- Most Pacific reefs have suffered some form of serious damaging event in the past decade, with climate change considered the major cause. Pacific reefs have shown strong recovery from many of these events, in part because levels of local threats from human activities are lower than in many other parts of the world.
- The extent of coral reef in the Oceania region is stable, but most reefs show declining quality around heavily populated areas.
- Although most coral reef fisheries have been sufficient for subsistence livelihoods,

commercial exploitation has rarely been sustainable.

- As Pacific island populations and development levels increase, local man-made threats to reefs will increase unless policy makers take definitive actions to control them.
- By 2050, most reefs in the Pacific are predicted to be rated as threatened, with more than half rated at high, very high or critical levels as a result.

### Background and relevance of indicator

Coral reefs and their associated ecosystems are fundamental to Pacific island life and cultural practices, providing goods and services such as food from fish, molluscs and algae, tourism benefits and shoreline protection. Oceania contains extensive coral reefs covering a huge area, with a multitude of reef types including fringing, barrier, double barrier, submerged barrier, platform, patch, oceanic ribbon, mid-ocean, atolls, oceanic atolls and near-atolls.

The world has lost an estimated 19% of productive reef area, with another 15% under immediate threat of loss. This indicator assesses the state of and threats to coral reefs across Fiji.



Coral Reef, Taveuni, Fiji  
Photo credit: Stuart Chape.

### How the indicator was assessed

Data for the indicator were extracted predominantly from Reefs at Risk assessments and Global Coral Reef Monitoring Network

(GCRMN) reports for the region and each specific country (Brooke and Hepburn 1992, Bryant et al. 1998, Wilkinson 2008, Spalding et al. 2010, Chin et al. 2011). High/Medium/Low threat level was taken from the Reefs at Risk assessment within the GCRMN report (2011).

### State

Fiji's coral reefs are some of the most extensive and diverse in the South Pacific and consist of a wide range of reef types. Fringing reefs, barrier reefs, platform reefs, oceanic ribbon reefs, drowned reefs, atolls and near-atolls span over 10,020 square kilometres, with a national average hard coral cover of 50% in 2011 (Sykes in Graham 2013). The Cakalevu barrier reef or Great Sea Reef, north of Vanua Levu, is exceptional in being one of the longest barrier reefs in the world (Lovell and Sykes 2004, Wilkinson 2008). Coral cover varies with reef type across the country, from 28% on Viti Levu's Coral Coast fringing reefs to over 70% in the deep-water pinnacles of the Vatu-i-Ra Passage (see Table 5). Monitoring data for Fiji are considered reliable and consistent (see Figure 2).

Reef systems are vitally important to the large proportion of the populace dependant on subsistence or small-scale commercial fishing and also to Fiji's extensive tourism industry.

In 2000 and 2002, Fiji's reefs suffered a temperature-related mass-bleaching event with the subsequent loss of 40–80% of stony corals across the country. At this time, the Global Coral Reef Monitoring Network (GCRMN) Fiji node was formed to coordinate a variety of data about current reef health from around the region (Lovell and Sykes 2004). Annual monitoring of up to 15 sites has shown a faster than expected recovery from coral bleaching, and by 2011, the national average hard coral cover and diversity was higher than before the event, showing the great resilience of reefs across the country.

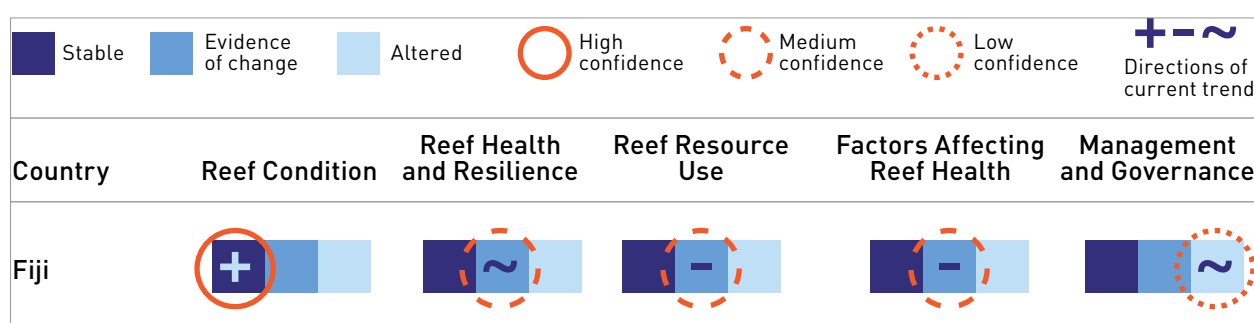
Fiji has made a commitment that 30% of its marine environment will be under protection or management by 2020. Much of this goal is being met by inclusion of coastal reefs in community-managed Locally Managed Marine Areas (LMMAs) within the 410 *i-qoliqoli* (traditional fisheries management areas) in the country. In 2013, the Fiji Locally Managed Marine Areas

Table 5 State of Fiji's coral reefs

| Reef condition and trend | Data confidence | 2007 reported coral cover | 2011 reported coral cover | Most recent reported coral damaging events  |
|--------------------------|-----------------|---------------------------|---------------------------|---|
| Stable +                 | High            | 18–62%<br>Average 45%     | 28–70%<br>Average 50%     | Temperature-related bleaching 2002<br>Crown-of-thorns starfish outbreak 2008 (on-going)<br>Cyclone 2012 |

Source: Wilkinson 2008 and Chin et al. 2011

Figure 2 Monitoring of Fiji's reefs



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 a 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 rises, 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.

Source: Bryant et al. 1998, Chin 2011

(FLMMA) network included 415 *tabu* (protected) areas within 143 *qoliqolis*, covering about 965 square kilometres (Fiji Locally Managed Marine Areas (FLMMA) 2013).

### Pressures and threats

Pressures on Fiji's coral reefs can be categorised into those arising from global factors, including climate change, and Fiji-specific local factors.

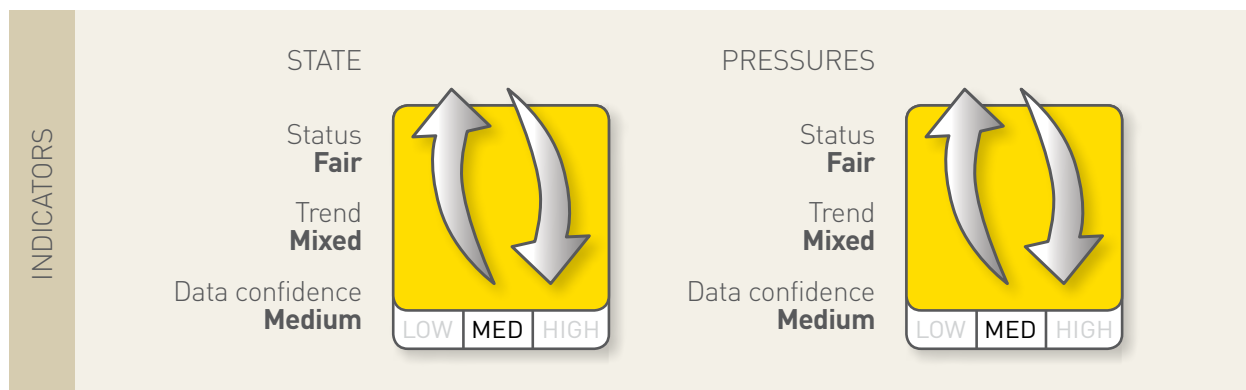
In *Reefs at Risk (Reefs at Risk Revisited – Global 2011)*, assessments of four Local Threats are combined into an Integrated Local Threat Index for each country (Bryant et al. 1998, Burke et al. 2011). Maps are created of each Threat factor, and an Integrated Threat Index can be determined based on the 2011 threats assessment. Maps of threat levels by 2030 are created by adding the projection of future thermal stress and ocean acidification to the present local threat levels.

### Global threat categories

Pressures on the health of coral reefs globally include factors associated with climate change, periodic storms and cyclones, coral diseases and predator outbreaks.

1. Climate change: Factors relating to climate change may have a negative effect on the health of Fiji's coral reefs and include increasing water temperature, ocean acidification and increased intensity of storms and cyclones.
2. Cyclones may cause local breakage of corals on shallow reef tops but have not caused large-scale damage in recent years and indeed, in many cases, have had a protective effect by dropping water temperatures by a full degree or more (Sykes and Morris 2007).
3. Coral health: Little coral disease has been observed on Fiji's reefs, probably due in part to their physical remoteness from large land masses and other reef systems. Higher





incidence of White syndrome has been observed since the 2000 coral bleaching episode, but this may be due to more intensive surveying of coral reefs rather than to an actual increase in incidence (Sykes and Morris 2007).

- Predation from invasive species including crown-of-thorns starfish (COTS) and corallivorous snails occurs across the archipelago in what appears to be regular outbreaks, probably linked to increasing coral cover. This has been best documented on the Suva reefs and in the Mamanuca Islands. Removal and poisoning of COTS have been tried in the Mamanuca Islands but with limited success (Sykes and Morris 2007).

#### *Local threat categories*

Fiji's increasing population has created greater pressure on reefs from fishing (especially near urban centres) and caused the loss of marine habitats and higher levels of pollution. At present, 66% of Fiji's reefs are considered to be at medium or higher threat level from local factors, which include:

- watershed-based pollution/sedimentation from developments and deforestation, such as mining, vegetation clearance for agriculture and forestry;
- marine pollution (ports, oil terminals, shipping channels, agricultural pesticides and fertilisers, and sewage from residential/tourist centres);
- coastal development (cities, settlements, airports and military bases, mines and tourist resorts); and
- overfishing as a result of higher population density and destructive fishing techniques (blast or cyanide fishing).

While most of Fiji's offshore reefs are in a good and stable condition, with good resilience, many reefs close to inhabited shores show chronic stress arising from local pressures, particularly nutrient and sediment pollution which have the greatest impact on inshore reefs (Lovell and Sykes 2004). The proliferation of high-impact logging operations in smaller coastal watersheds of Vanua Levu and Viti Levu is one of the major drivers of freshwater and coastal degradation (Atherton et al. 2006).

In certain areas around the larger islands, high levels of sedimentation and nutrient pollution arising from coastal development, agricultural chemicals and mining waste run-off have changed the ecology of the fringing reefs from coral-dominated to algal-dominated reefs. Lack of controls on reef dredging for channels and coastal development has physically destroyed some reefs. Mangrove clearance and conversion is significantly reducing important breeding grounds for many reef species.

Lack of attention to these local threats is likely to affect the coral reefs' capability to resist and recover from global-level pressures, and to put most of Fiji's reefs, particularly around Viti Levu and eastern Vanua Levu Islands, at High to Critical Threat level by 2030 (Chin et al. 2011).

### 1.3.2 Mangrove ecosystems

#### Key points

- The Pacific islands, while containing only 3.8% of the global mangrove area, support unique mangrove community structures and provide valuable site-specific services and products.

- Due to limited monitoring, there is little information available on pressure on mangroves or trends in the area and health of Pacific Island mangroves.
- Mangroves may experience serious problems due to rising sea level, and low island mangroves may already be under stress. A reduction in area by 13% of the current 524,369 hectares of mangroves of the sixteen Pacific island countries and territories where mangroves are indigenous is predicted using an Intergovernmental Panel on Climate Change (IPCC) upper projection for global sea level rise by the year 2100.
- In addition to climate change effects, mangroves and other coastal ecosystems face numerous other threats, ranging from filling for development to disease outbreaks.

### Background and relevance of indicator

Mangroves are one of the vitally important coastal ecosystems of the region. Their complex root structures allow them to survive the roughest of weather and to protect coastal communities from coastal erosion. They also provide nursery and feeding grounds for fish and other marine animals that Pacific islanders rely on for food security and income. This indicator assesses key pressures and threats to mangrove ecosystems in Fiji.

### How the indicator was assessed

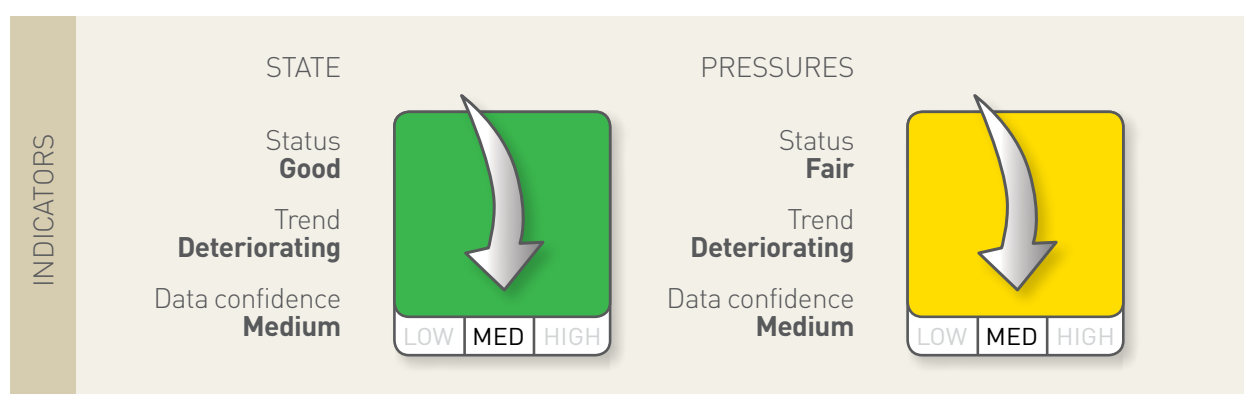
Information on mangrove area, diversity, threats and climate change predictions was sourced from various reports and publications (Wall and Hansell 1975, Food and Agriculture Organisation of the United Nations (FAO) 1995, Ellison et al. 1999, Duke et al. 2012, Anderson et al. 2013).

Many of the statistics and pressures cited are from studies done as part of the project Mangrove Ecosystems for Climate Change Adaptation and Livelihoods (MESCAL), which was implemented in Samoa, Tonga, Vanuatu, Fiji and Solomon islands from 2010 to 2013 (Duke et al. 2012), with further information from the following: Lal 1991, Scott 1993, Food and Agriculture Organisation of the United Nations (FAO) 2005, Ellison 2010, Spalding et al. 2010b, Tuiwawa et al. 2013, Watling 2013.

### State

Fiji has the third largest mangrove area (380 square kilometres) in the Pacific Islands, after PNG and Solomon Islands. The largest of these stands (covering over 90% of Fiji's mangrove area) are found along the south-east and north-west coasts of Viti Levu, with extensive cover around the deltas of the Ba, Rewa and Nadi rivers and on the northern shores and the Labasa river delta on Vanua Levu (Spalding et al. 2010b, Watling 2013).

These areas are characterised by four major forest or habitat types, namely *Rhizophora* forest, *Bruguiera* forest, mixed mangrove forest and species growing on the landward edge of the mangrove forest (Tuiwawa et al. 2013). Three species (*Bruguiera gymnorhiza*, *Rhizophora stylosa* and *R. samoensis*) and a hybrid of the family *Rhizophoraceae* (*R. x selala*.) overwhelmingly dominate the vegetation. Less common species include *Xylocarpus granatum*, *X. moluccensis*, *Lumnitzera littorea*, *Excoecaria agallocha* and *Heritiera littoralis*. The broad zonation consists of a seaward fringe of *R. stylosa*, *R. x selala* or occasionally *R. samoensis* found along the river margins and a mixed forest of *B. gymnorhiza*, *X. granatum* and *Lumnitzera littorea*. *R. stylosa* is dominant in all exposed



locations and is particularly associated with sandy or coarse substrates, while *R. samoensis* is most frequently encountered bordering the depositional side of rivers and creeks over soft, fine-grained substrates.

### Pressures and threats

Mangroves in Fiji are under pressure from coastal development, clearance and reclamation for urbanisation, tourism and conversion to aquaculture and agriculture. There was a 4% reduction in mangrove cover in Fiji over the ten-year period 1991–2001, with some localities recording a loss of cover of 60–70% due to unmanaged conversion of mangroves (see Table 6). Traditional exploitation of mangrove resources (timber extraction and overharvesting of fishes and invertebrates) and pollution also threaten mangrove ecosystems. These threats can cause a reduction of area available for mangroves, increased risk of coastal erosion, a decline in mangrove species and changes to fish and invertebrate spawning grounds. Non-human influences such as direct effects of climate change and sea level rise pose minimal threat.

**Table 6** Estimates of change in mangrove area in Fiji in response to relative sea level change under climate change predictions for countries with mangroves, including Fiji

| Total land area (km <sup>2</sup> ) | No. of species (Hybrids) | Area (km <sup>2</sup> ) | 2100 projected area (km <sup>2</sup> ) IPCC upper projection <sup>7</sup> |
|------------------------------------|--------------------------|-------------------------|---|
| 18,272                             | 7 (1)                    | 525.03                  | 173.43  |

### 1.3.3 Seagrasses

#### Key points

- Seagrass beds are important marine habitats and nursery and feeding grounds.
- They also have important sediment-stabilising and water-quality regulating functions.
- Species richness is greatest in the western Pacific, declining to the east, with no seagrass found in the far east of the region.

- Detailed data are available in some countries, but many have no or extremely limited data on location or state of seagrass beds.
- Many seagrass beds have been destroyed or severely affected by localised coastal development, but there are few data on large-scale state.

#### Background and relevance of indicator

The shallow subtidal and intertidal zones around the coasts of Pacific island countries and territories often support large areas of seagrass, extending long distances away from the shoreline in lagoons and sheltered bays and often adjoining coral reefs. Seagrasses are of special interest to coastal fisheries worldwide because of the role they play in providing nursery areas for commonly harvested fish and invertebrates.

In addition to their roles as nursery areas, seagrasses provide feeding habitats for many species of fish as well as endangered sea turtles. In some countries and territories of Oceania, such as Palau and the Solomon Islands, seagrass beds are vital feeding grounds for the endangered marine mammal, the dugong.

Seagrasses and intertidal flats are also permanent habitats for several species of sea cucumbers, the main group of invertebrates targeted as an export commodity in the region, and for a wide range of molluscs gleaned for subsistence. Movement of nutrients, detritus, prey and consumers between mangrove, seagrass and intertidal habitats can have major effects on the structure and productivity of food webs, with nutrient and detritus increasing primary and secondary productivity both directly and indirectly. Both mangroves and seagrasses improve water quality by trapping sediments, nutrients and other pollutants.

Most seagrasses in the tropical Pacific are found in waters shallower than 10 metres and usually close to island shores. Their growth and health is limited by several factors, including water clarity, nutrient availability and exposure to wave action. Changes in these factors, whether caused by climate change or local human activities, may quickly destroy seagrass beds. Seagrass is also the favoured food of the

dugong, and changes in its availability are likely to affect dugong populations.

### How the indicator was assessed

Data for the indicator were extracted from a recent report (Waycott et al. 2011) as well as from a literature search of relevant papers and reports (Ellison et al. 1999, Coles et al. 2011).

High/ Medium/Low threat level was based on projected percentage loss under three possible climate change scenarios, where <5% loss = Low threat, 6-20% = Medium, and 21-35% = High. Confidence levels were taken as 5-32% = Low, 33-66% = Medium, and 67-100% = High.

### State

Fiji has an estimated area of 16.5 square kilometres of seagrass beds spread across the coastal intertidal flats around the country (Waycott et al. 2011), comprising five seagrass species and one sub-species (see Table 7) (Tuiwawa 2013, Ellison 2009, Skelton and South 2006).

Seagrass beds are important habitats and traditional collecting grounds for many fish and invertebrates. They are also important feeding grounds for turtles and therefore are instrumental in the survival of these species, including green turtles from as far afield as American Samoa and French Polynesia (Craig et al. 2004; Sykes and Morris 2007).

There are few published studies of seagrass in Fiji, and no long-term data showing trends in growth or decline. However greater information on seagrass diversity is becoming available as result of monitoring of seagrass beds undertaken in the past few years by Seagrass Watch and Seagrassnet. In many parts of Fiji, seagrass beds appear in a healthy state, but others are being smothered with epiphytic algae and affected by terrestrial sediments, particularly in areas with increasing coastal populations and development, such as the Mamanuca Islands, Coral Coast and Suva. Seagrass areas around Savusavu Bay have declined in recent years.

Long-term ecological studies of seagrass meadows on Suva Reef revealed that losses

**Table 7** Species of seagrass found in Fiji

| Species                                     | Habitat  | Distribution in Fiji   | Global distribution                               |
|---|--|--|---|
| <i>Halophila ovalis</i>                     | Shallow coastal intertidal areas to 10 metres deep | Common, often sparsely spread  | Globally widespread                               |
| <i>Halophila ovalis</i> ssp. <i>bullosa</i> | Subtidal areas to 5–10 metres deep                 | No information   | Only found in Fiji, Tonga and Samoa               |
| <i>Halophila decipiens</i>                  | 10–30 metres                                       | Deepwater passages, infrequently observed. First recorded in Fiji in 2004 in northern Vanua Levu | Globally widespread                               |
| <i>Syringodium isoetifolium</i>             | Subtidal areas to 1.5 metres deep                  | Common in large beds   | Western Pacific, South-east Asia and Indian Ocean |
| <i>Halodule uninervis</i>                   | Subtidal areas to 1.5 metres deep                  | Common in large beds   | Western Pacific, Asia, Eastern Africa             |
| <i>Halodule pinifolia</i>                   | Shallow coastal intertidal areas to 10 metres deep | Common in large beds   | Western Pacific, Indian Ocean                     |

occurred in some years because of major disturbances such as tsunamis, cyclones and flood (Vuki 1994). Analyses of spatial patterns of seagrass meadows from airborne images revealed oscillations in abundance on Suva Reef; seagrass meadows extended toward the lagoon in some years and regressed in others (McKenzie et al. 2007). Regressions in seagrass meadows on Suva back-reef areas were attributed to high turbidity and siltation caused by foreshore reclamation (Vuki 1994, cited by McKenzie et al. 2007). Coastal modifications mostly occur near urban areas. At least 110 hectares have been reclaimed in Suva since 1881 (Vuki et al. 2000 cited by McKenzie et al. 2007).

## Pressures and threats

Pressures on seagrass beds are similar to those for coral reef ecosystems and include global pressures related to climate changes, such as increasing cyclone incidence and alterations to rainfall, temperature and light levels. Sea-level rise is expected to result in the loss of those seagrasses growing in deep water at their present depth limit. Loss of seagrass habitats in Fiji as a result of factors related to climate change are estimated to reach <5% by the year 2035 and between 5 and 20 % loss by 2100 (Waycott et al. 2011).

Many of the Fiji-specific factors threatening coral reefs also threaten coastal seagrass beds, including:

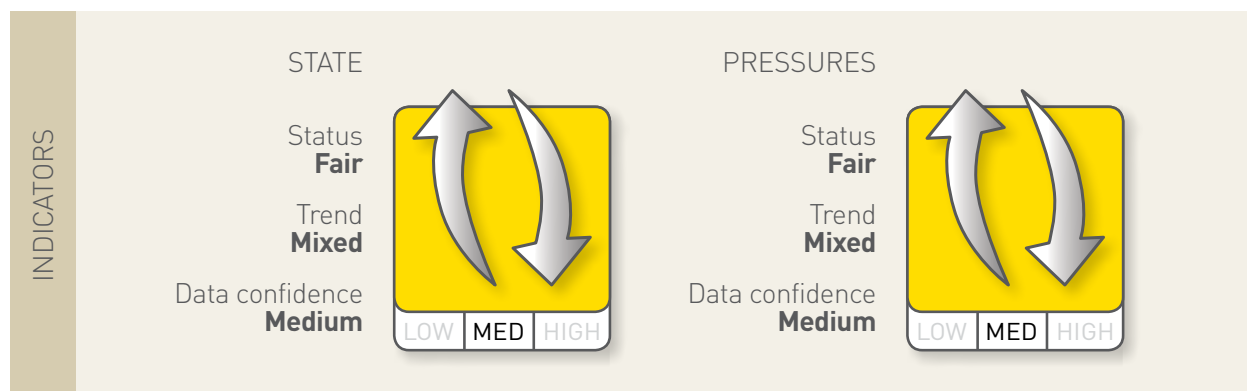
- high turbidity and siltation arising from foreshore reclamation (Suva), flooding of deforested areas (Nadi), and high turbidity and toxic waste from gold and copper mining (Viti Levu and Vanua Levu);

- poor water quality from inadequate sewage treatment and toxins from shipping;
- eutrophication (algal enrichment) by nutrient enrichment from agricultural run-off; and
- reef-flat excavations for channels and tourism developments in the Mamanuca Islands.

These local factors are likely to have a greater effect on seagrass areas in coastal areas near population centres than the global pressures, if the local pressures remain uncontrolled or poorly controlled as at present. Stronger implementation of existing development and environmental guidelines and policies could assuage many of these pressures if there were sufficient resources and governmental will. Local threats to seagrasses include coastal residential and tourism development, inadequate disposal of solid waste, sewage pollution, depletion of fisheries, coral harvesting, coastal erosion, storm surge and flooding, and siltation of rivers and coastal areas as a result of soil erosion, inland agriculture and forestry, and sand mining (McKenzie et al. 2007).

Around many coastal areas, in particular Nadi, the Coral Coast and the Mamanuca Islands, excavation of channels and reef-top pools for resort developments have destroyed and disturbed seagrass beds. Inadequate sealing of the sides of channels continues to cause sedimentation, leading to longer-term degradation of surviving beds (Sykes 2003–2013). In addition, the few mines (gold and copper) found in Fiji create sedimentation and, in some cases, toxic waste run-off into rivers and subsequently into coastal waters (Sykes and Morris 2007).

One of the largest threats to coastal fringing reefs, especially in the most populated and





developed urban areas, the Coral Coast of Viti Levu and the islands of the Mamanuca and Yasawa chains, is eutrophication, resulting in algal overgrowth. This change is attributed to nutrient enrichment and over-fishing of herbivorous animals and/or sedimentation from soil erosion in water-catchment areas. On the north and west coasts of the two largest islands, Viti Levu and Vanua Levu, this pattern is probably related to large-scale sugarcane agriculture, which has caused deforestation and subsequent soil erosion into rivers and creeks, and also the use of chemical fertilisers, which wash into waterways during times of high rainfall (Sykes and Morris 2007).

## 1.4 Marine ecosystems

### 1.4.1 Ocean health

#### Key points

- Oceania supports the world's largest tuna fisheries, yet stocks of the major species are declining or are overfished. Bigeye tuna stock is in a critical condition, with fishing mortality well in excess of its Maximum Sustainable Yield level; yellowfin is also overfished.
- Six marine turtle species feed and migrate through Oceania, and the Pacific region supports the world's largest remaining nesting populations of green and hawksbill turtles.
- Over-exploitation has reduced many fish stocks throughout the Pacific, limited fish catches and caused ecological shifts that reduce biodiversity and productivity. By-catch during commercial fishing activities and live capture and harvesting for the aquarium trade contribute to these effects.
- The biggest threats to ocean health are climate change, particularly through effects of rising sea temperatures, acidification and de-oxygenation, and over-exploitation, mainly over-fishing.
- The Pacific small island developing states are amongst the most vulnerable countries to climate change, especially to sea level rise and climate perturbation. Changes in oceanic

circulation and precipitation patterns are already evident.

- Evidence is accumulating that ocean oxygen levels are declining while acidification is increasing.
- Habitat destruction, extractive activities, pollution and invasive species are also serious threats.
- Seabed mining has the potential to damage large areas of benthos, but detailed effects are currently undetermined.
- Any further deterioration of the ocean could have a significant effect on the economic well-being of Pacific Islanders, primarily those residing in or near coastal areas.

#### Background and relevance of indicator

The Pacific Ocean covers half of the world's surface and is the largest ecosystem in the world. The coastal and marine environments of Oceania sustain numerous activities that fuel local, national and international economies and provide livelihoods and food security for millions of people. Evidence is mounting that this unique ecosystem is being adversely affected by overfishing, habitat destruction, pollution and climate change. Fishing of large predators (such as sharks, tuna and billfish) has a particularly negative effect on the ocean by, for example, allowing an increase in the abundance of their prey or influencing prey species by causing behavioural changes to their habitat use, activity level and diet.

Oceanic megafauna populations cannot support the massively increased fishing pressure to which they are currently subjected: for example, more than 5,645 commercial vessels alone were actively fishing in the Pacific Ocean in 2011.

The oceans are fundamental to the Earth's carbon cycle, climate and weather patterns, which ultimately maintain all life on the planet. Although generally described as separate oceans, with the Pacific being the largest at about 46% of the total hydrosphere, they are all interconnected, and ocean boundaries are arbitrary. Migratory species frequently cross these ocean boundaries. While ocean ecosystems are relatively low-production areas, their vast size means that their contribution to global production is relatively large.

The Pacific Ocean is larger than the Earth's total land mass. The vast size also correlates with high biodiversity resources, although much of it is under-explored and relatively unknown, particularly the deeper ocean systems.

### How the indicator was assessed

Much of this information came from IUCN Oceania report 2010 (Siedel and Lal 2010, Chassot et al. 2012) with additional information from other sources (SPREP 2007, Herr and Galland 2009, Morgan et al. 2009, Harley et al. 2012, Miller and Prideaux 2013).

Key findings from the recent International Program on State of the Ocean (IPSO) Center for Ocean Solutions reports (International Programme on the State of the Ocean 2013, Rogers and Laffoley 2013) and scientific papers and reports were used to identify key threats to ocean health.

### State, Pressures and threats

#### Global factors

A recent assessment of global factors affecting ocean health (Rogers and Laffoley 2013) identified the greatest causes for concern as acidification, warming and reduced oxygen levels.

These three factors will interactively affect ocean health and have cascading consequences for marine biology, including altered food-web dynamics and increases in pathogen impacts.

Table 8 details data published in the Pacific Climate Change Science Program Countries Report showing projected changes in the annual mean climate conditions and oceanic conditions for Fiji under low, medium and high

greenhouse gas emissions scenarios (IPPC emissions scenarios B1, A1B and A2). The projections discussed are not specific to a city or state; they refer to an average change over the geographic region of the country of interest and the surrounding ocean.

The level of confidence associated with a given projection is described as high, moderate or low. The determination of an appropriate confidence level depends upon expert judgement by Pacific Climate Change Science Program scientists.

#### Acidification

If current levels of greenhouse gas release continue, extremely serious consequences are predicted for ocean life and, in turn, for food and coastal protection. At CO<sub>2</sub> concentrations projected for 2030–2050, erosion will exceed calcification in the coral reef-building process, resulting in the extinction of some coral species, significant effects on coral reefs and declines in biodiversity overall.

Ocean acidification is measured using aragonite saturation. Aragonite is a form of calcium carbonate used by marine animals to build structures and shells. Aragonite saturation is a ratio that compares the amount of aragonite present with the total amount that the water could hold if it were completely saturated. The more negative the change in aragonite saturation, the larger the decrease in aragonite available in the water, and the harder it is for marine organisms to produce skeletons and shells. *In the case of Fiji, there is moderate confidence in a decline in aragonite saturation of approximately 0.4 by 2090 under a low emissions scenario (Table 8).*

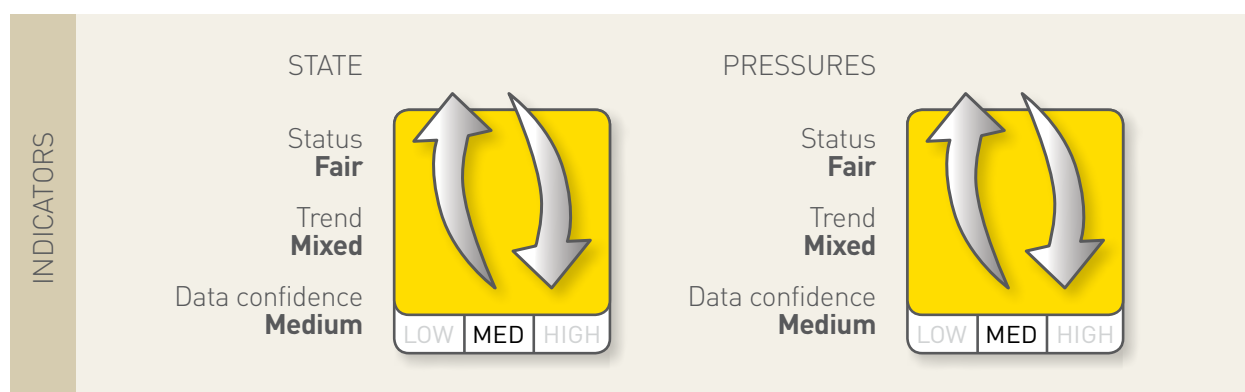


Table 8 Pacific Climate Change Science Program Countries Report

| Variable                         | Emission scenario | 2030       | 2055        | 2090        | Confidence |
|----------------------------------|-------------------|------------|-------------|-------------|------------|
| Surface air temperature (°C)     | Low               | +0.6 ± 0.4 | +1.0 ± 0.5  | +1.4 ± 0.7  | Moderate   |
|                                  | Moderate          | +0.7 ± 0.5 | +1.4 ± 0.5  | +2.1 ± 0.8  |            |
|                                  | High              | +0.7 ± 0.3 | +1.4 ± 0.3  | +2.6 ± 0.6  |            |
| Total rainfall (%)               | Low               | +3 ± 11    | +1 ± 10     | +2 ± 14     | Low        |
|                                  | Moderate          | +1 ± 12    | +3 ± 14     | +3 ± 16     |            |
|                                  | High              | +2 ± 13    | +4 ± 13     | +7 ± 15     |            |
| Sea-surface temperature (°C)     | Low               | +0.6 ± 0.4 | +0.9 ± 0.4  | +1.3 ± 0.4  | Moderate   |
|                                  | Moderate          | +0.6 ± 0.3 | +1.2 ± 0.4  | +1.9 ± 0.6  |            |
|                                  | High              | +0.7 ± 0.4 | +1.3 ± 0.4  | +2.4 ± 0.4  |            |
| Aragonite saturation state (Ωar) | Low               | +3.5 ± 0.1 | +3.2 ± 0.1  | +3.1 ± 0.1  | Moderate   |
|                                  | Moderate          | +3.4 ± 0.1 | +3.0 ± 0.1  | +2.6 ± 0.1  |            |
|                                  | High              | +3.4 ± 0.1 | +3.0 ± 0.1  | +2.5 ± 0.1  |            |
| Mean sea level (cm)              | Low               | +10 (5–16) | +18 (10–27) | +32 (16–47) | Moderate   |
|                                  | Moderate          | +10 (5–15) | +20 (9–31)  | +39 (20–59) |            |
|                                  | High              | +10 (3–16) | +20 (8–31)  | +41 (21–62) |            |

### Warming

The ocean is undergoing significant warming, with direct and well-documented physical and biogeochemical consequences. The effects of continued warming in the decades to 2050 are predicted to include increasing stratification of ocean layers, leading to oxygen depletion and increased incidence of anoxic and hypoxic (low oxygen) events, although the significance of these effects in the Pacific is unclear. *For Fiji, there is moderate confidence in a 1.3°C rise in sea surface temperature under a low emissions scenario (Table 8).*

### Reduced oxygen levels

There is increasing evidence that, in addition to the coastal hypoxia events that have increased in frequency globally due to eutrophication, there is a general trend for reduced oxygen levels in tropical oceans over the last 50 years (Pitcher and Cheung 2013). This trend is due to a number of climate change-related processes, principally increased sea surface temperatures. Estimates indicate a decline in the total mass oxygen

content of the oceans of between 1 and 7% by 2100 (Pitcher and Cheung 2013).

### Local factors

#### Utilised species

Continued overfishing is further undermining the resilience of ocean systems, and in many cases, fisheries management is failing to halt the decline of key species and damage to marine ecosystems. A recent FAO report (Food and Agriculture Organisation of the United Nations (FAO) 2012) indicated that 70% of world fish populations are exploited unsustainably, of which 30% show population declines to less than 10% of unfished levels. A recent global assessment of compliance with Article 7 (fishery management) of the 1995 FAO Code of Conduct for Responsible Fisheries (Pitcher and Cheung 2013) awarded 60% of countries a 'fail' grade and saw no country identified as being overall 'good'. See below for an assessment of Utilised species in Fiji.

### Marine pollution

Human activities that change the marine environment by altering water quality, such as sedimentation from mining or agricultural practices, may make it unsuitable for marine animals with precise environmental requirements. Other than oil and gas extraction, most pollution in the ocean originates from industry, agriculture or domestic sources on land. Deep-sea mineral extraction is a potential future threat.

While ocean systems are generally less exposed to land-based sources of pollution, and the vast bulk of the oceans means that dilution is extreme, there are accumulations of persistent pollutants in the oceanic gyres, such as the South Pacific Subtropical Gyre (Eriksen et al. 2013). The most visible of these is plastic litter, but persistent organic pollutants have also been shown to accumulate in the gyres and may be bio-concentrated in the fish food chain (Gassel et al. 2013).

### Marine bioinvasions

Marine ecosystems are also significantly threatened by invasive species. Shipping transports marine species and their larvae over huge distances and introduces them as invaders into new ecosystems. This transport can happen deliberately (for example, when ballast water taken aboard a ship in one region is dumped in another) or accidentally.

## 1.4.2 Utilised species

### Key points

- Oceania waters provide food and livelihoods for peoples both within and outside the region. Fishing activities range from subsistence reef food gathering to foreign fishing vessels licensed to fish in national waters under quota, the fees secured providing valuable revenue for nations.
- In Oceania, 70–80% of the catch from inshore fisheries is used for subsistence purposes, with around 20% going to markets.
- Overfishing and the loss of marine biodiversity are negatively affecting coastal ecosystems throughout Oceania.

- Pelagic fish stocks are monitored to try to assure sustainability; however, each year, illegal fishing activity is detected.
- Locally managed marine areas have the potential to improve reef ecosystems, restore marine biodiversity and reverse the effects of overfishing on fish stocks.
- The main aquaculture industries in Oceania are pearls in French Polynesia and the Cook Islands, prawns in New Caledonia and seaweed in Kiribati.
- International markets for bêche-de-mer, trochus, live coral and live reef fish, coupled with the aquarium trade, in conjunction with fishing pressure from increasing human populations have reduced stocks of marine species generally in Oceania.

### Background and relevance of indicator

Oceania waters provide food and livelihoods for peoples both within and outside the region. Fishing activities range from subsistence reef food gathering to foreign fishing vessels licensed to fish in national waters under quota, the fees secured providing valuable revenue for nations.

### How the indicator was assessed

Information for this indicator was sourced from several publications and reports (Forum Fisheries Agency (FFA) 1993, Ministry of Marine Resources (MMR) 2000, Anon 2009, Gillett 2009, 2011, Pratchett et al. 2011, Anon 2013, Western and Central Pacific Fisheries Commission (WCPFC) 2013).

### State

#### *Coastal fisheries*

Coastal fishing in Fiji is carried out for subsistence purposes, for sale in local markets and for export. The distinction between subsistence and commercial fishing in the larger, less isolated islands is often blurred as the fishing activity is becoming increasingly monetised in those areas. Subsistence fishing is greatest away from the urban centres, while the commercial fishing is geared at supplying urban food markets and for export. The exports consist of both food items (such as finfish) and non-food

commodities (for example, trochus for buttons or aquarium fish).

Coastal fishing uses a wide variety of fishing techniques and involves about 1,300 mainly small outboard-powered vessels. The most common commercial means are gillnetting, hook-and-line fishing and spearfishing. Some of the commercial fisheries use highly specialised techniques, such as for the capture of aquarium fish. A single fishing trip by a commercial operation often involves the use of several types of gear.

Subsistence fishing revolves around reef gleaning, hook-and-line fishing and spearfishing. It has been estimated that 50% of all rural households are involved in some form of subsistence fishing.

Estimates of catches from the coastal fisheries vary widely. The Fisheries Department statistics on coastal commercial fishing are estimated from a statistical system that only covers a portion of the commercial catch, and the Fisheries Department estimates of subsistence catch are based on a crude 1979 small-scale fishing survey which only covered the main island. Using various sources of data (including non-fishery surveys), it has been recently estimated by the Asian Development Bank that Fiji's coastal fishery production consists of about 17,400 (worth USD 33,812,500) tonnes by subsistence fishing and 9,500 tonnes (worth USD 33,750,000) by commercial fishing.

A study by the Secretariat of the Pacific Community in 2010 partitioned the above coastal catches into categories: demersal fish 64.9%, nearshore pelagics 19.6%, and invertebrates 15.5%.

The coastal fisheries catch a large number of finfish and invertebrate species. Over 100 species of finfish and 50 species of invertebrates are included in Fiji's fish market statistics. The catch from the coastal subsistence fisheries is even more diverse. According to recent reports from the Fisheries Department, the most commonly targeted food finfish are *Lethrinidae* (emperors), *Serranidae* (groupers), *Carangidae* (trevallies), *Lutjanidae* (snappers), *Mugilidae* (mulletts), *Scombridae* (tunas), *Acanthuridae* (surgeonfishes), *Scaridae* (parrotfishes) and *Sphyrnaeidae* (barracudas). The common

invertebrates are bivalve molluscs, sea cucumbers, seaweeds, prawns, lobsters and octopus.

Landings from the coastal commercial fishery are made mostly at population centres. It is estimated that the three main urban areas (Suva, Lautoka and Labasa) are the landing points for two-thirds of the coastal commercial production of the country. The Suva urban area receives nearly half of the total commercial landings, or about 4,500 tonnes per year. Subsistence fishery landings occur at villages throughout the coastal areas of the country, roughly in proportion to the distribution of the population.

In terms of objectives of the management of fisheries in Fiji:

- For the coastal commercial fisheries, there are no formal objectives in the legislation or management plans, but judging by past activities of the Fisheries Department, the management objectives are to promote sustainability of resources, maximise economic returns and assure that these commercial fisheries do not negatively interact with subsistence fisheries.
- For the subsistence fisheries, there are no formal objectives for most of the 406 traditional management areas, but subsistence fisheries are managed generally for the protection of village food supplies. Recent initiatives sponsored by international NGOs involve promotion of biodiversity conservation as an objective in the management of village resources.

The management of coastal commercial fishing focuses on licensing, which is different for fishing inside demarcated areas (customary fishing rights areas; involves negotiation with traditional authorities) and outside demarcated areas (involves negotiation with government authorities). Apart from licensing, other important management measures are area restrictions, minimum size requirements, bans on destructive fishing, restrictions on taking some species, restrictions on exports and restrictions on fishing gear.

Measures for the management of the subsistence fisheries are diverse. Traditional authorities, usually a single hereditary chief, in each of the 406 fisheries management areas



characteristically make management decisions after considering the views of their resident stakeholders. The measures often involve limiting access by outsiders to the fishing areas and various types of input restrictions on the fishing activities of local residents. Common restrictions include bans on the use of gillnets, commercial fishing on Sunday and diving compressors. A recent trend is for some of the areas to have an external partner (such as the local branch of an international NGO) who assists in management activities, often by promoting the concept of marine protected areas. In recent years, communities and management partners have been formalised into a network, the Fiji Locally Managed Marine Areas (FLMMA).

Although there has been much research carried out on Fiji's coastal fisheries resources, information on the status of the range of coastal species was last compiled into a readily-accessible form about 20 years ago. That report (Richards 2004) shows that the status of most resources is largely unknown, but includes the following information:

- **reef fish:** Reports from the early to mid-1980s state that during that period, over-fishing was generally not a problem in the rural areas, although reef fish stocks were under heavy pressure near main population centres. However, with the increase in the commercial catch since then combined with an unquantified increase in subsistence catch, sustained local depletions of species groups, such as mullet (kanace), rabbitfish (nuqa) and coral trout (donu), and individual species, such as the double-headed parrotfish (*Bolbometopon muricatus* - kalia), have prompted some resource owners to ban the use of gillnets and SCUBA diving equipment in several fishing-rights areas of Fiji;
- **lobster:** Given the probable wide dispersal of *P. penicillatus* phyllosoma larvae and the many unexploited reefs which can potentially provide recruitment to exploited reefs, it is a reasonable assumption that *P. penicillatus* stocks in the Pacific will be resilient to recruitment overfishing. It is possible that Fiji's reefs may be settled by larvae spawned in neighbouring countries as well as by those spawned in Fiji;
- **trochus:** In most countries, trochus fisheries have been characterised by sharp fluctuations in annual production, typically followed by periods of reduced harvest. Trochus are easily collected and thus vulnerable to over-exploitation, which has occurred in many countries. With the 1988 peak in raw shell exports and the additional demand from button factories, recruitment overfishing may have occurred on heavily fished reefs, followed by a steady decline in major stocks. There have been no recent stock-assessment surveys for trochus shell in Fiji;
- **pearl oyster:** Following an extensive pearl oyster (civa) survey, it was concluded that Fiji's civa stocks were very depleted and, in some areas, exhausted. The poor condition of the stocks was attributed to heavy fishing pressure and, in some locations, environmental stress caused by water-borne agricultural chemicals and general pollution of inshore areas by land-derived effluent;
- **giant clams:** Because giant clams are sedentary, large and easily collected, the resource is very vulnerable to exploitation. Although giant clams are comparatively fast growing, there appears to be low recruitment of juveniles to the fishery. Fiji's stocks of *T. gigas*, the largest species, have been wiped out, and stocks of *T. derasa* are depauperate. Due to low-level but continuous artisanal harvesting of *T. derasa* over hundreds of years and estuarine influences creating unsuitable habitats, this species is scarce around the larger inhabited islands.

#### *Offshore fisheries*

Virtually all the production from the offshore fisheries is by longline gear. Locally-based longliners usually undertake fishing trips from 5 to 15 days in length, using ice to preserve the catch. In recent years, the fleet size has ranged from 40 to 100 operational vessels. Most of the local longline vessels are between 20 and 35 metres in length. Almost all the catch by foreign-based vessels is by longline gear, using mechanical refrigeration to freeze the catch during voyages that can last up to several months. A small amount of tuna purse seining by American vessels occurs sporadically in the northern part of the Fiji's zone.

Information supplied to the Western and Central Pacific Fisheries Commission (WCPFC) by the Fiji government shows that:

- in recent years, the annual tuna catch by Fiji-flagged longline vessels has ranged from 12,000 to 14,000 tonnes;
- about 60% of the above catch was albacore; and
- in 2012, the Fiji longline fleet consisted of 70 licensed vessels, of which 11 vessels were chartered Chinese-flagged vessels. In addition, other tuna vessels were based in Fiji, but fished outside the Fiji zone.

Fiji has considerable tuna-related infrastructure, including 7 processing facilities, 3 major fisheries and a cannery.

All locally based offshore vessels unload their catch in Suva, the capital and largest urban area. The foreign-based offshore vessels dispose of their catch either at their home port (mainly in Asia), at the tuna cannery in Levuka (located on the island of Ovalau, near Suva) or onto another vessel via trans-shipment at Suva or a port outside the country.

The management of the fishery is focussed on a cap on the number of licenses for longline vessels and to a lesser degree a total allowable catch (TAC) of tuna in the Fiji zone. For the year 2012, the number of vessels was capped at 70, with a TAC for tuna of 15,000 tonnes.

### Pressures and threats

The main issues in Fiji coastal fisheries include:

- the fully exploited nature of many of the coastal resources, especially those close to the urban markets;
- difficulties associated with marketing products from the remote areas where abundance is greatest to the urban areas where the marketing opportunities are greatest;
- fuel cost increases, which have a disproportionate effect on the small-scale motorised fisheries;
- difficulties for small-scale fishers in accessing the offshore fishery resources; and
- lack of awareness on the part of coastal communities of the development limitations and the consequences of over-exploitation.

Some the issues in Fiji's offshore fisheries are:

- competition by offshore vessels for access to limited infrastructure and services;
- the difficulties in establishing and maintaining a cap on the number of vessels allowed in the offshore fishery; and
- limited dialogue and understanding between the Fisheries Department and the tuna industry.

Fiji is a member of the Western and Central Pacific Fisheries Commission that was established by the Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean. The Convention entered into force in June 2004.

Because the tuna are a regional resource, their assessment is most appropriately carried out across the western and central Pacific Ocean. Recent assessments by the Secretariat of the Pacific Community indicate concern over tuna stock condition of bigeye and to a lesser degree yellowfin. Numerous attempts in recent years within the Western and Central Pacific Fisheries Commission to prevent an increase in bigeye and yellowfin catches have not been successful. The total catch of bigeye in the region in 2012 was 161,679 metric tons, which was a 7% increase over the average of 2007–2011. The yellowfin catch in 2012 was 655,668 metric tons, which was a 22% increase over 2007–2011.

The three types of offshore fishing result in by-catch, with longlining producing the most and pole and line fishing the least. Relatively good data are available on the by-catch in the Fiji zone and are published by the WCPFC. On a regional basis, there is concern over the condition of some shark species taken as by-catch, most notably the silky shark and the oceanic whitetip shark.

# 2 Native species

Much of biodiversity conservation in the countries and territories of the SPREP region is focussed on individual species. This set of indicators focuses on pressures on individual species using three different measures. First, pressures on those species currently classified as 'Threatened' in the IUCN Red List of Threatened Species (International Union for Conservation of Nature (IUCN) 2013) (Table 9) are assessed. Second, because of their additional vulnerability, pressures on species found only in one of the countries and territories (single-country endemic species) are assessed. Third, recognising that over half of the world's known species of cetaceans are found in the region along with the world's largest remaining populations of dugongs and green, hawksbill and loggerhead turtles, the pressures those species face are assessed.

Despite incomplete knowledge of most taxa, Fiji is known to have high diversity of marine species due to the large number of different habitats within the group. Fiji also has a strong affinity with the centre of Indo-Pacific marine species diversity to the west of the Pacific, although Fiji has lower species diversity in comparison to these areas (Veron 1995). This pattern is due to the moderate isolation of Fiji from areas of higher diversity in the western island archipelagos, such as the Solomon Islands.

- Fiji's mangrove flora is composed of eight mangrove species and a unique hybrid. It is dominated by *Bruguiera gymnorrhiza* (dogo), *Rhizophora stylosa* and *Rhizophora samoensis* (both tiri) and a sterile hybrid *R. selala* (selala), which is a cross between *Rhizophora stylosa* and *Rhizophora samoensis*.

## Terrestrial and freshwater species

### Marine and coastal species

- A relatively high level of biodiversity is found on the reef systems: 219 species of stony corals, five species of gorgonian corals or sea fans, 15 species of zoanthids and 1,198 species of coral reef fish have been identified in Fiji (Lovell and Sykes 2004).
- Fiji's reef fishes are moderately well known: a preliminary listing of reef, pelagic and deep-water bottom fish by Baldwin and Seeto (1986, unpubl.) contains a total of 1,198 species from 162 families (including pelagic deep-water bottom fish species).
- Three species of sea turtles nest in Fiji: hawksbill (*Eretmochelys imbricate*), green turtle (*Chelonia mydas*) and loggerheads (*Caretta caretta*).
- The molluscs are comparatively well collected and described, with over 760 species of gastropods and bivalves. Solem (1974) recorded 58 species of terrestrial gastropod for Viti Levu. Haynes (1998) recorded 62 species of freshwater molluscs and crustacean, with seven being endemic and one endemic monotypic genus, *Fijidoma maculate*, found in the fast-flowing headwaters of the Rewa River.
- The total number of vascular plants known from Fiji is approximately 2,600, of which 1,600 are native and 1,000 are introduced. The single endemic family Degeneriaceae has two species. Of the 450–470 genera, 11 are endemic.
- The most recent and complete list of algal flora listed 422 taxa.

- It has been reported that of the Macrolepidoptera (butterflies and large moths), Fiji has 400 species with seven endemic genera. Fiji has more endemic genera and more endemic radiation than any other Pacific island group with the exception of Hawaii.
- Fiji's only indigenous mammals are bats of which there are six known species, four of which are large fruit bats (megachiropterans) and two are small insectivorous species (microchiropterans).
- Fiji's terrestrial reptile fauna consists of snakes, iguanas, geckos and skinks with 12 known endemics. The single endemic genus is the elapid snake, the Fiji burrowing snake *Ogmodon vitianus*.
- Fiji has two endemic frogs: the Fiji tree frog (*Platymantis vitensis*) and Fiji ground frog (*P. vitianus*).

## 2.1 Threatened species

### Key points

- Of the 3,166 threatened species (2013) in the 22 Pacific Island nations assessed in the State of Conservation in Oceania 2013 report, most occur in the marine (59%) biome, followed by the terrestrial biome (33%).
- Invasive species have the greatest effect on the largest numbers of terrestrial threatened, Critically Endangered endemic and non-endemic species, followed by effects of land-use change due to agriculture, farming and forestry activities, and exploitation.

### Background and relevance of indicator

Extinction rates are disproportionately high on islands, with approximately 80% of all known species extinctions occurring on islands. This indicator focuses on the pressures on endemic and non-endemic species that face the highest risk of extinction: those species classified as 'Threatened' (species belonging to the top three classifications of Critically Endangered, Endangered and Vulnerable: CR+EN+VU) in

the IUCN Red List of Threatened Species. Cnidaria (for example, corals, jellyfish and sea anemones) were excluded from the much of the analysis because specific threats are not identified in the Red List database. Non-coral marine species that were retained and analysed included sharks, rays and skates, sea birds, shore fish, marine mammals, sea turtles and sea snakes.

### How the indicator was assessed

Data for this indicator were compiled from the IUCN Red List of Threatened Species online public database (Version 2013.1). Information was extracted from the text by identifying threat categories that were relevant in the assessment and interpreting the absolute estimated threat level. For each species, a High/Medium, Low or Potential threat level was assigned to each threat category. Threats were categorised as follows: Residential and commercial development and transport (Development); Agriculture, farming and forestry (Agriculture); Energy production and mining (Mining); Biological resource use (Exploitation);



The Fiji long-legged warbler (*Trichocichla rufa*) was first collected in 1890. Four specimens were collected between then and 1894, after which, despite some unconfirmed sightings, the species was not seen again until 1974. In 2003, scientists from BirdLife International working in Wabu Forest Reserve on Fiji's main island discovered a small population of 12 pairs, along with two recently fledged chicks. The main threat to this species is the introduced mongoose, which is one of the biggest threats to ground-nesting birds in the Fiji Islands.

Photo credit: Kevin Vang, ©W Dabrowka, Birdexplorers.com.

Anthropogenic otherwise uncategorised habitat loss/degradation (Habitat loss); Invasive species (Invasives); Genetic (hybridisation/inbreeding) (Genetic); Pollution; Geological events; Extreme weather and climate change (Climate); Fire, unclear whether natural or anthropogenic (Fires); and Other, such as disease (Other). Only the ten worst threats were graphed.

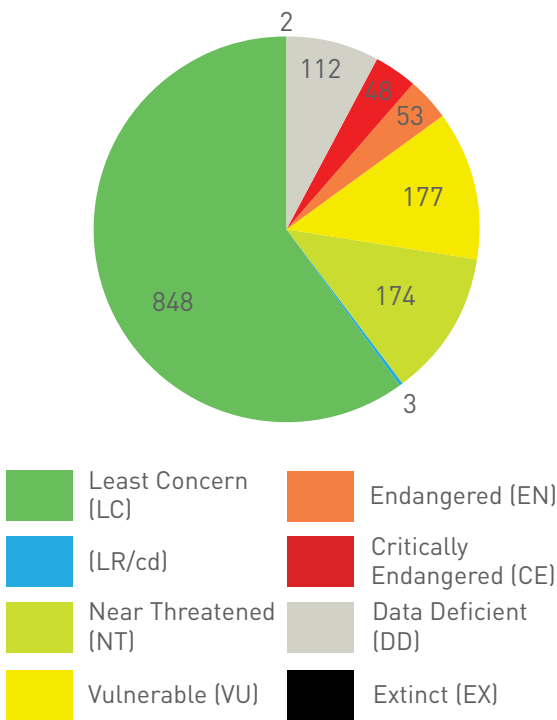
State

As of August 2013, 1,417 species in Fiji were assessed according to the IUCN Categories and Criteria for inclusion in the Red List of Threatened Species. Table 9 provides a summary of these species, and Figure 3 shows the assessed species by category. While the majority of assessed species are found in marine habitats, a greater percentage of terrestrial species are threatened. This pattern can be explained by the more restricted range of many terrestrial species and the extent of human impact on terrestrial ecosystems.

Threatened (CR, EN or VU) fauna of Fiji are predominantly corals in the order Scleractinia, which comprise 21% of a total of 278 threatened species. Therefore, corals have been excluded from the country threats analysis and covered in the Regional State of Conservation Report. A total of 191 species excluding Cnidaria (hydras, polyps, jellyfishes, sea anemones and corals) are recorded as threatened in Fiji on the IUCN Red List Fiji. In general, terrestrial species are more threatened, with amphibians, reptiles, molluscs and various plant families containing the largest number of threatened species. An exception to this pattern is the sharks and rays.

One species of bird has been recorded as Extinct: the Bar-ringed Rail, *Nesoclopeus poecilopterus*; and one species of plant: *Weinmannia spiraeoides* (Order Rosales). Based on the observation that two other non-endemic rails declined into extinction due to predation by introduced cats and mongoose, it appears highly likely that these invasives were responsible for the demise of *N. poecilopterus* in Fiji. The Fiji long-legged warbler (*Trichocichla rufa*) was thought to be Extinct, but recent sightings have confirmed its existence.

Figure 3 Number of assessed species in each category



Pressures and threats

Of the total non-Cnidarian threatened (CR, EN or VU) species recorded in the IUCN Red List in Fiji (n = 191), invasive species and agriculture are the two primary threats to threatened species of flora and fauna in Fiji, affecting 42% and 36% of threatened species, respectively (see Table 12).

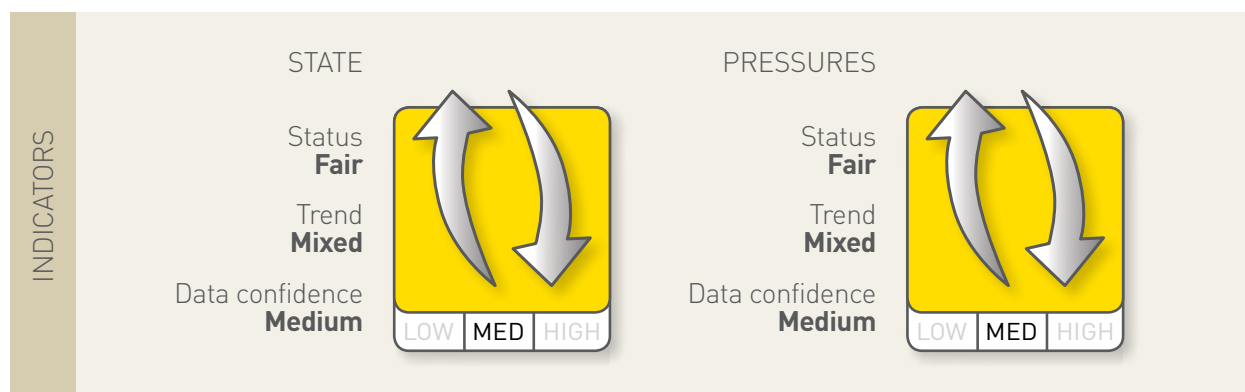
In terms of invasive species, predators such as cats (*Felis catus*), rats (*Rattus* sp.) and mongoose (*Herpestes javanicus*) and habitat-modifiers such as goats (*Capra hircus*) and pigs (*Sus scrofa*) have the greatest effect on single-country endemics in Fiji. Potential future introductions of predators such as the giant African snail (*Achatina fulica*), the rosy wolf snail (*Euglandina rosea*) and the flatworm (*Platydemus manokwari*) are also a major concern. Agricultural activities of concern include cattle farming, logging, wood harvesting and shifting cultivation practices (which can include conversion to coconut and sugarcane plantations in Fiji).



Table 9 Fiji species included on the IUCN Red List (version 2013.1)

| Taxonomic group | Sub-group                          | Number of species assessed | No. of species assessed as threatened (CR, EN, VU) | No. of species assessed as Data Deficient | Estimated number of species described* |
|-----------------|------------------------------------|----------------------------|--|---|--|
| Plants          | Bryophytes                         | 0                          |  |   | 300                                    |
|                 | Ferns and allies                   | 1                          |  |   | 250                                    |
|                 | Cycads                             | 1                          | 1  |   | 8                                      |
|                 | Conifers                           | 8                          | 3  |   | 21                                     |
|                 | Gnetopsida                         | 1                          |  |   | unknown                                |
|                 | Magnoliopsida (Dicotyledons)       | 118                        | 51   | 1   | 1,320                                  |
|                 | Liliopsida (Monocotyledons)        | 42                         | 10   | 1   | 390                                    |
|                 | Algae                              | 0                          |  |   | 100                                    |
| Vertebrates     | Birds                              | 101                        | 14   |   | 101                                    |
|                 | Mammals                            | 26                         | 6  | 10  | 26                                     |
|                 | Reptiles                           | 25                         | 14   | 1   | 36                                     |
|                 | Amphibians                         | 2                          | 1  |   | 2                                      |
|                 | Bony fish (freshwater and marine)  | 361                        | 7  | 39  | 1,200                                  |
|                 | Cartilaginous fish                 | 15                         | 6  |   | 15                                     |
| Invertebrates   | Insects                            | 8                          |  | 3   | 750                                    |
|                 | Arachnids                          | 0                          |  |   | 65                                     |
|                 | Hard corals (Anthozoa)             | 410                        | 87   | 16  | 410                                    |
|                 | Molluscs (bivalves and gastropods) | 204                        | 68   | 20  | unknown                                |
|                 | Crustaceans                        | 41                         |  | 6   | unknown                                |
|                 | Hydrozoa                           | 6                          |  |   | unknown                                |
|                 | Holothuroidea (sea cucumbers)      | 45                         | 10   | 14  | 45                                     |
|                 | Other invertebrates                | 2                          |  | 2   | unknown                                |
| Fungi           |                                    | 0                          |  |   | 415                                    |
| <b>Totals</b>   |                                    | <b>1,417</b>               | <b>278</b>   | <b>114</b>                                | <b>5,104*</b>                          |

\* These are likely to be under-estimates in many cases and include only native species



**Table 10** Threats faced by extant IUCN Red Listed threatened species (CR, EN, VU) in Fiji (excluding Cnidaria species)

| Relative ranking | Threat type       | No. of species | % species |
|------------------|-------------------|----------------|-----------|
| 1                | Invasives         | 80             | 42        |
| 2                | Agriculture       | 69             | 36        |
| 3                | Habitat loss      | 34             | 18        |
| 4                | Development       | 23             | 12        |
| 4                | Climate           | 19             | 10        |
| 5                | Mining            | 17             | 9         |
| 5                | Human disturbance | 17             | 9         |
| 6                | Fire              | 6              | 3         |
| 6                | Exploitation      | 6              | 3         |
| 7                | Pollution         | 4              | 2         |

\*\*Agriculture refers to agriculture, farming and forestry. Habitat loss refers to anthropogenic un-categorised habitat loss, degradation or fragmentation. Development includes transport. Climate refers to extreme weather and climate change. Mining includes energy production. Fire may be either natural or anthropogenic in origin (unspecified)

## 2.2 Endemic species

### Key points

- Of the 2,189 single-country endemic species recorded across Oceania, 115 (5.3%) are already extinct, and 12 (0.5%) now exist only in captivity.
- In total, 930 of the 2,062 extant single-country endemic species (nearly 45%) are at a risk of extinction.
- Land-use change due to agriculture, the spread of invasive species, fires, habitat degradation and alteration, mining activities and over-exploitation are the main threats to all single-country endemic species.
- The biggest threats to single-country endemic species classified as Threatened are the spread of invasive species followed by land-use change due to agriculture, fires and habitat loss.

### Background and relevance of indicator

Endemic species once extinct are lost forever. Endemic species found only on one island or group of islands in Oceania are particularly vulnerable to the consequences of increasing human activity. This indicator identifies the key pressures and threats to single-country endemic species and the extent to which these species have already been affected. Most of these species are terrestrial because information about marine endemic species is lacking generally. Species extinction or species decline disrupt ecological processes and may also lead to cascading and catastrophic co-extinctions.



Silktail (*Lamprolia victoriae*) is endemic to Fiji. It is classified as 'Near Threatened' in the IUCN Red List of Threatened Species. Major threats include loss of habitat due to logging and land-use change

Photo credit: Margaret Sloan

## How the indicator was assessed

Data for the indicator were extracted from the IUCN Red List of Threatened Species Version 2013.11.

A High/Medium, Low or Potential threat level was assigned to each pressure in order to compare actual and potential threats as well as their relative estimated level of severity. The relative importance of different pressures was also analysed in relation to current conservation status using the IUCN Red List categories (CR/EN/VU = Critically Endangered/Endangered/Vulnerable; LR/LC/NT = Low Risk/Least Concern/Near Threatened; DD = Data Deficient).

**Table 11** Total number and percentage of extant IUCN Red List single-country endemic species in Fiji affected by each threat type\* with relative ranking given

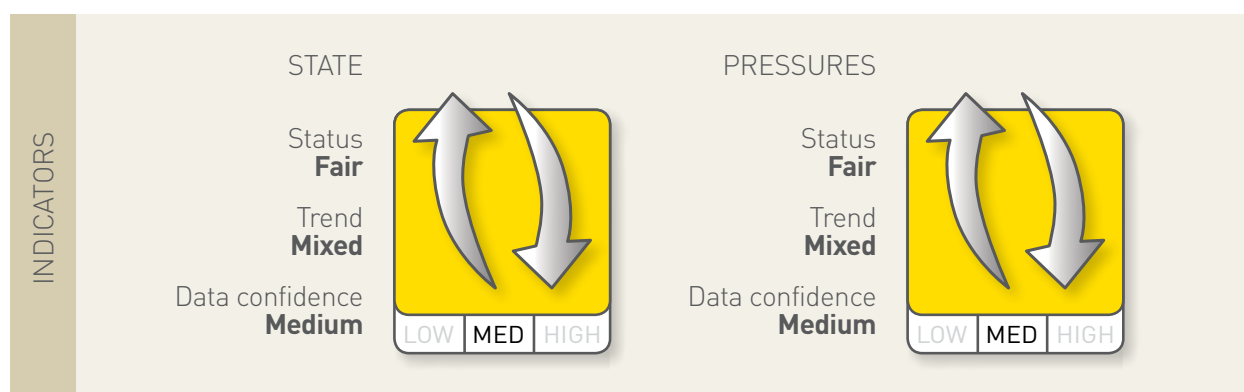
| Relative ranking | Threat type       | No. of endemics | % endemics |
|------------------|-------------------|-----------------|------------|
| 1                | Invasives         | 85              | 33         |
| 2                | Agriculture       | 81              | 31         |
| 3                | Habitat loss      | 24              | 9          |
| 4                | Development       | 23              | 9          |
| 5                | Climate           | 21              | 8          |
| 6                | Exploitation      | 18              | 7          |
| 7                | Mining            | 8               | 3          |
| 8                | Fire              | 7               | 3          |
| 9                | Human disturbance | 4               | 2          |
|                  | Pollution         | 4               | 2          |

(Source: IUCN 2013)

\* Agriculture refers to agriculture, farming and forestry. Habitat loss refers to anthropogenic un-categorised habitat loss, degradation or fragmentation. Development includes transport. Climate refers to extreme weather and climate change. Mining includes energy production. Fire may be either natural or anthropogenic in origin (unspecified)

## State

Of a total of 258 extant Fijian endemics, 45% are plants, and 34% are molluscs (Class Gastropoda). Over half (56%) of these endemics have been assessed as threatened, with 32% listed as Critically Endangered.



## Pressures and threats

In general, the threats to endemics reflect those pressures affecting threatened species. However, while threats to endemics were found to be at lower levels than threats to threatened species, it is pertinent to note that 10% of the endemic species have been classed as Data Deficient (DD). A further 105 (41%) of non-Data Deficient Fijian endemics were recorded as 'No data available (unknown or unspecified)', indicating the paucity of information available for over 50% of all endemics.

Invasive predatory species including cats, pigs, goats and the black rat (*Rattus rattus*) represent the greatest threat to endemics (and threatened endemics) in Fiji (Table 11). The other major threat is agricultural expansion, which is associated with habitat disturbance and an increase in invasive species.

## 2.3 Threatened migratory marine species

### Key points

- The key threats to cetaceans are from fisheries operations, boat strikes, habitat degradation and pollution, anthropogenic noise, climate change and unregulated tourism.
- The major threat to marine turtle populations remains the direct harvest and illegal poaching of eggs and adults of all species. Climate change is predicted to be an increasing threat.
- The population status of many species of cetaceans and is poorly known. The ability to quantify and address threats is hampered by the absence of regular research and monitoring of species distributions and abundance globally and in the Pacific Region.

### Background and relevance of indicator

Over half of the world's known species of cetaceans are found in the Pacific region, and

the Pacific also supports the world's largest remaining populations of dugongs and green, hawksbill and loggerhead turtles. These species are vulnerable to a wide range of threats including fisheries by-catch; human harvest; habitat loss and degradation from coastal development; pollution and pathogens; and climate change.

### How the indicator was assessed

Data for the indicator were extracted from the IUCN Red List of Threatened Species (International Union for Conservation of Nature (IUCN) 2013) for dugongs, migratory marine turtles and cetaceans. Key sources of information on population status and threats to marine species included species assessments, peer-reviewed journal articles and regional and global reports on marine species (Marsh et al. 2002, Miller 2007, Garrigue et al. 2008, International Union for Conservation of Nature (IUCN) 2008, Polidoro et al. 2011, Wallace et al. 2011, Coral Reef Research Foundation 2012, Secretariat of the Pacific Regional Environmental Programme (SPREP) 2013b).

Threats were ranked from 0 (data deficient) to 3, with threat levels of 1 (low), 2 (medium) and 3 (high).

### State

#### Cetaceans

Species found in Fiji can be seen in Table 12. Fiji signed the Pacific Islands Cetacean Memorandum of Understanding in 2006, which aims to conserve cetaceans and their habitats in the Pacific Islands Region with full protection of species listed in CMS Appendix 1 (Convention on Migratory Species (CMS)). Humpback whale migration surveys have been carried out since the signing of the CMS Cetacean MoU, and a checklist of other cetaceans has been developed in conjunction with humpback whale surveys (South Pacific Whale Research Consortium (SPWRC) 2004).

Activities to address cetacean conservation in Fiji include:

- identification and establishment of protected areas. Cetaceans have been given priority in the Vatu-i-ra seascape for the migratory route of humpback whales and other cetaceans. Proposed Marine Protected Areas will also include important dolphin habitat;
- education and public awareness. Campaigns have been undertaken to raise awareness of cetaceans in Fiji;
- species protection. Formulation of the Whale and Dolphin Management Plan is underway to protect Fiji's EEZ which has been declared a Whale Sanctuary. This addresses both species and habitat protection.

### Marine Turtles

The IUCN Marine Turtle Specialist Group (MTSG) conducts regular Red List assessments of each marine turtle species on a global scale (Wallace et al. 2011). Three species are recorded from Fiji, as seen in Table 12: green turtle, *Chelonia mydas*; leatherback turtle, *Dermochelys coriacea*; and hawksbill turtle, *Eretmochelys imbricata*. Population trends of green turtles are unknown; hawksbill populations are decreasing, and whilst populations of leatherbacks are stable in the short term, the long-term trends indicate decreasing populations. Regional Management Units (RMUs) have been established based on bio-geographical data for each species which provide a framework for defining populations for assessment (Wallace et al. 2011). Fiji is located within the Pacific South Central RMU for the green turtle, *Chelonia mydas*, Pacific West RMU for the leatherback turtle and Pacific South Central for the hawksbill turtle (Wallace et al. 2011).

## Pressures and threats

### Cetaceans

The main threats to cetaceans in the Pacific Islands are by-catch in fishing operations (including purse seines and gill nets); vessel strikes (particularly if marine mammal watching operations are poorly managed); entanglement in marine debris and ingestion of discarded plastic; anthropogenic noise (including seismic

surveys and military sonar); and climate change, which may not only result in changes of distribution of ocean currents and prey species but may also lead to some key prey species, such as squid, declining in abundance. In most cases, the ability to further quantify and address these threats is hampered by gaps in species knowledge as well as lack of monitoring or assessment in the region (Miller 2007).

### Marine turtles

Threats to marine turtles include:

- fisheries effects via by-catch mortality, habitat destruction and food web effects;
- harvest, including the taking of turtles and eggs. Green and hawksbill turtles continue to face exploitation, as they are traditionally hunted for food throughout Fiji;
- habitat degradation via coastal development, nesting beach degradation, seafloor dredging, vessel traffic, construction and changes to vegetation and dune systems;
- pollution and pathogens, including plastics and other marine debris affecting cetaceans and marine turtles as well as light pollution disrupting turtle nesting and hatchling behaviour;
- boat strikes and ecotourism; and
- global climate change, which may affect sex ratios of turtle hatchlings and cause loss of nesting beaches.

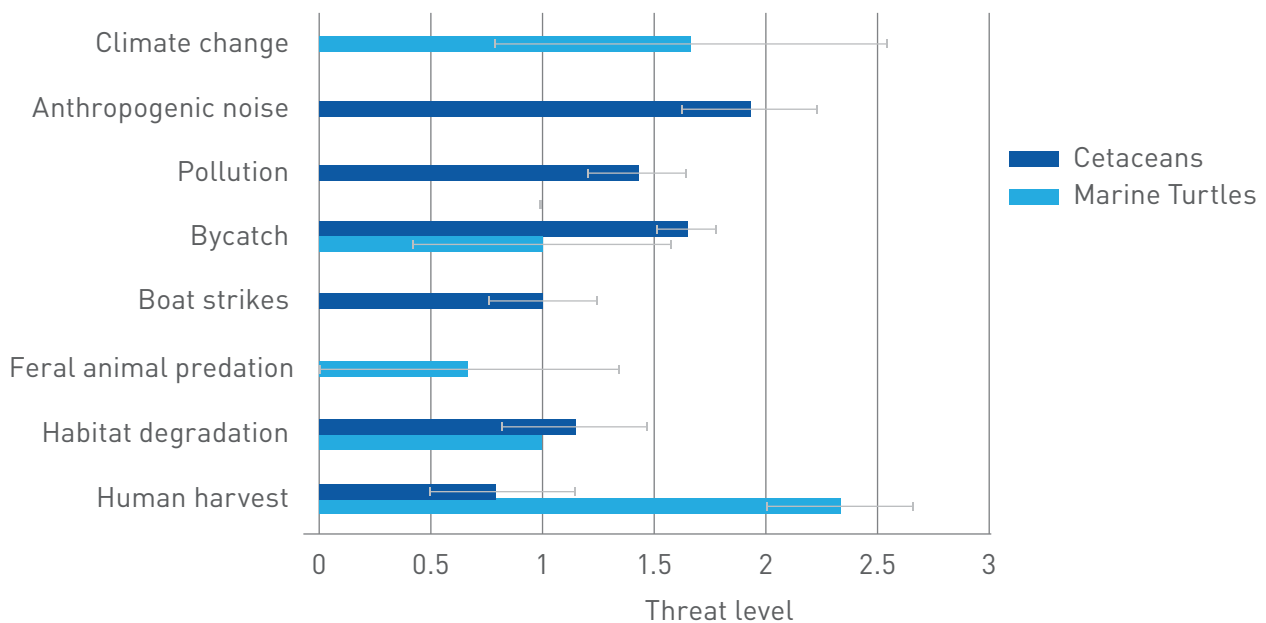


Table 12 Marine species of conservation concern in Fiji

| Genus                                  | Common name                 | IUCN Red List status 2008 | Population trend worldwide | Fiji popn. size |
|--|-----------------------------|---------------------------|----------------------------|-----------------|
| <b>Marine turtles</b>                  |                             |                           |                            |                 |
| <i>Dermochelys coriacea</i>            | Leatherback turtle          | CR A1abd                  | Decreasing                 | Unknown         |
| <i>Eretmochelys imbricata</i>          | Hawksbill turtle            | CR A2bd                   | Decreasing                 | Unknown         |
| <i>Chelonia mydas</i>                  | Green turtle                | EN A2bd                   | Decreasing                 | Unknown         |
| <b>Cetaceans – confirmed sightings</b> |                             |                           |                            |                 |
| <i>Balaenoptera musculus</i> sp.       | Blue whale                  | EN                        | Increasing                 | Unknown         |
| <i>Balaenoptera physalus</i>           | Fin whale                   | EN                        | Unknown                    | Unknown         |
| <i>Physeter macrocephalus</i>          | Sperm whale                 | VU A1d                    | Unknown                    | Unknown         |
| <i>Balaenoptera</i> sp.                | Minke whale                 | LC                        | Stable                     | Unknown         |
| <i>Megaptera novaeanglia</i>           | Humpback whale              | LC                        | Increasing                 | Unknown         |
| <i>Stenella attenuata</i>              | Pantropical spotted dolphin | LC                        | Unknown                    | Unknown         |
| <i>Tursiops truncatus</i>              | Bottlenose dolphin          | LC                        | Unknown                    | Unknown         |
| <i>Balaenoptera</i> sp.                | Bryde's whale complex       | DD                        | Unknown                    | Unknown         |
| <i>Globicephala macrorhynchus</i>      | Short-finned pilot whale    | DD                        | Unknown                    | Unknown         |
| <i>Kogia breviceps</i>                 | Pygmy sperm whale           | DD                        | Unknown                    | Unknown         |
| <i>Mesoplodon densirostris</i>         | Blainville's beaked whale   | DD                        | Unknown                    | Unknown         |
| <i>Orcinus orca</i>                    | Orca, killer whale          | DD                        | Unknown                    | Unknown         |
| <i>Pseudorca crassidens</i>            | False killer whale          | DD                        | Unknown                    | Unknown         |
| <i>Stenella longirostris</i>           | Spinner dolphin             | DD                        | Unknown                    | Unknown         |

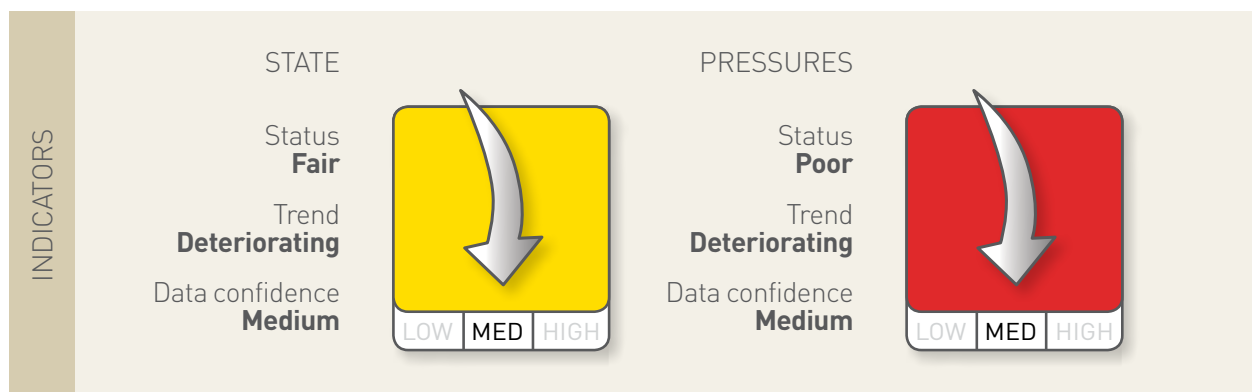
■ Critically endangered (CR)
 ■ Endangered (EN)
 ■ Vulnerable (VU)
 ■ Least concern (LC)

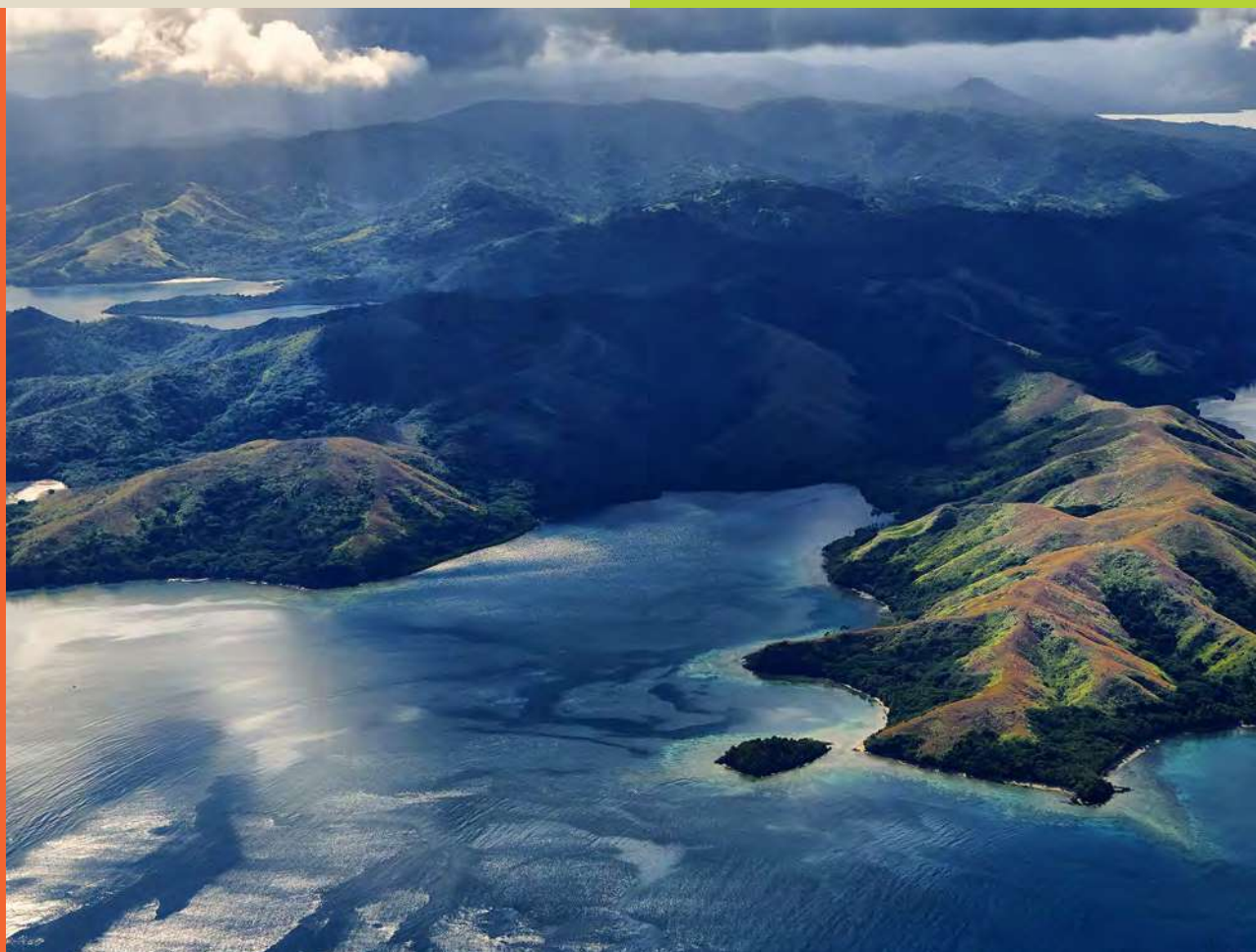
**Figure 4** Assessed threats to migratory marine species in Fiji based on MTSG data for the Pacific South Central RMU for the green turtle and hawksbill turtle, and Pacific West for the leatherback turtle and mean values for cetaceans based IUCN Red List 2008 global species assessments



Threat levels are 0 (data deficient), 1 (low), 2 (medium) and 3 (high).

Source: Wallace et al. 2011, [www.iucnredlist.org](http://www.iucnredlist.org)





Southern coastline, Vanua Levu, Fiji.  
Photo credit: Stuart Chape

## RESPONSE

|                            |    |
|----------------------------|----|
| 3 Environmental governance | 40 |
| 4 Conservation initiatives | 46 |

Responses to protect and conserve Oceania's terrestrial and aquatic biodiversity must be built on a sound platform of national and international legislation and traditional governance mechanisms. The establishment of protected areas is a key component of national biodiversity programmes, as is direct action to mitigate impacts of invasive species, over-exploitation, habitat loss and climate change guided by appropriate national action plans, such as National Biodiversity Strategy and Action Plans.

This section examines the extent of protected areas, participation in and national implementation of international biodiversity agreements and specific policy and management actions to deal with invasive species.

# 3 Environmental governance

## 3.1 Multilateral Environment Agreements

### Key points

- Most of the Pacific island countries have made commitments to the main biodiversity Multilateral Environmental Agreements (MEAs), in particular the Convention on Biological Diversity.
- Pacific island territories of France, New Zealand, the United Kingdom and the United States are non-parties to MEAs but have, to various degrees, delegated authority for environmental governance, and some may be party to regional agreements.

### Background and relevance of indicator

This indicator identifies the status of the ratification of environment-related MEAs for Fiji and shows the extent of commitment of Fiji to international cooperation for the good of all mankind and its natural habitats. The MEAs considered in this assessment include the following:

- (a) Cartagena Protocol on Biosafety
- (b) Convention on Biological Diversity (CBD)
- (c) Convention on the Conservation of Migratory Species of Wild Animals (CMS) and relevant Memoranda of Understanding
  - i. The Memorandum of Understanding on the Conservation and Management of

Dugongs and their Habitats throughout their Range (Dugong MoU)

- ii. The Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA Marine Turtle MOU)
- iii. Pacific Islands Cetaceans
- iv. The Memorandum of Understanding (MoU) on the Conservation of Migratory Sharks

(d) Convention on Wetlands of International Importance (Ramsar)

(e) Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

(f) Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (Nagoya Protocol)

(g) United Nations Convention on the Law of the Sea (UNCLOS)

(h) United Nations Framework Convention on Climate Change (UNFCCC)

(i) Convention Concerning the Protection of the World Cultural and Natural Heritage (WHC)

### How the indicator was assessed

The data for each Pacific island country's status of commitment to the MEAs were extracted from the InforMEA country profile and relevant MEA Country profiles (InforMEA 2014).



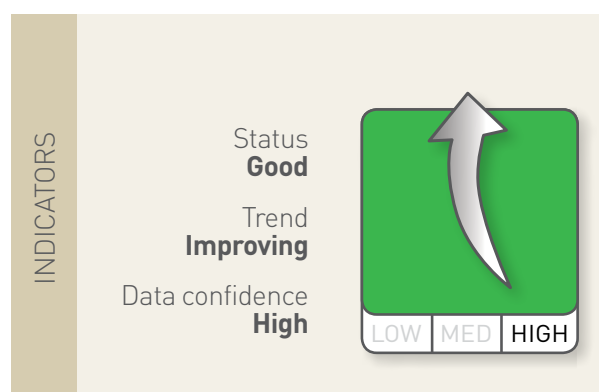
## State

The Republic of Fiji is a sovereign democratic state. Fiji is a former colony of the United Kingdom, which was responsible for Fiji's foreign relations at that time. Many United Kingdom treaties were specifically extended to Fiji, and fortunately, none of the main biodiversity conservation MEAs were signed prior to 1970 or Fiji would have been required to resolve issues relating to succession to treaties formerly entered into by the United Kingdom.

Fiji has signed, ratified, accepted, adhered to or acceded to key MEAs (Table 13).

Appendix A shows the scope at which these MEAs are implemented at the national and sub-national level, reflecting the commitment that the Fiji has taken to integrating its international commitments at the national level. National implementation is through regional

involvements via regional MEAs, policies, legislations, strategies and action plans.



**Table 13** Fiji and Multilateral Environmental Agreements (MEAs)

| Multilateral Environmental Agreements   | Signed, ratified, accepted, adhered to or acceded to |
|---|--|
| Cartagena Protocol on Biosafety   | ✓  |
| Convention on Biological Diversity (CBD)  | ✓  |
| Convention on the Conservation of Migratory Species of Wild Animals (CMS) and relevant Memoranda of Understanding   | ✓  |
| The Memorandum of Understanding on the Conservation and Management of Dugongs and their Habitats throughout their Range (Dugong MoU)                                      |  |
| The Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA Marine Turtle MOU) |  |
| Pacific Islands Cetaceans   | ✓  |
| The Memorandum of Understanding (MoU) on the Conservation of Migratory Sharks   |  |
| Convention on Wetlands of International Importance (Ramsar)   | ✓  |
| Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)   | ✓  |
| Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (Nagoya Protocol)                            | ✓  |
| United Nations Convention on the Law of the Sea (UNCLOS)  | ✓  |
| United Nations Framework Convention on Climate Change (UNFCCC)  | ✓  |
| Convention Concerning the Protection of the World Cultural and Natural Heritage (WHC)   | ✓  |

## 3.2 National policies and legislation

### Key points

- Most Pacific island countries have enacted legislation relating to environmental protection or have enacted sectoral legislation containing environmental protection provisions.
- Also, most Pacific island countries have not enacted specific or comprehensive legislation to address the obligations of state parties under the MEAs.
- Updating environmental legislation is urgently needed in the region but is hindered by the lack of capacity and resources to develop, monitor and enforce environmental legislation and is delayed by bureaucratic processes.

### Background and relevance of indicator

This indicator identifies the status of national implementation of the biodiversity conservation MEAs that Fiji has signed or ratified. It focuses on identifying the specific legislations that Fiji has developed and enforced. For the purpose of this report, 'legislation' refers to statutory law enacted by legislature or a governing body in the Pacific island countries and territories. Where no specific legislation is available, the indicator focuses on related legislation that has aspects relevant to the objectives of the biodiversity conservation MEAs.

### How the indicator was assessed

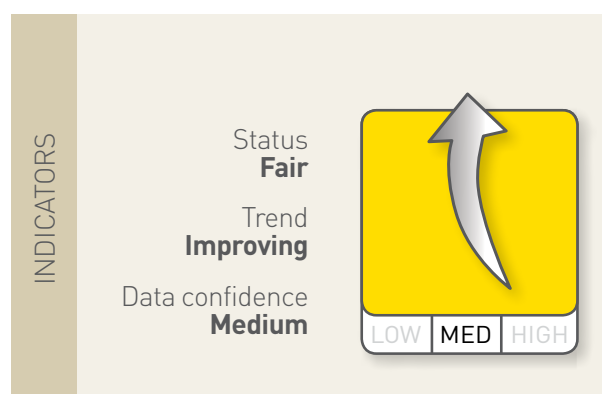
The data for Fiji's status of national implementation commitment to the MEAs were assessed through research and extracted from various sources (ECOLEX 2013, Pacific Islands Legal Information Institute (PACLII) 2013, Secretariat of the Pacific Regional Environmental Programme (SPREP) 2013a) and relevant government websites, published reports and various articles. Whilst every endeavour was made to obtain the current

legislation, policies, strategies and action plans, consultation with relevant government departments is needed to ensure more recent developments have been considered.

### State

Effective institutional arrangements or regimes are important for environmental management and conservation, in particular the implementation and enforcement of national legislations and policies that support the conservation of biodiversity.

Appendix B attached indicates both governmental and inter-governmental institutions established in Fiji to govern the conservation and management of terrestrial and marine ecosystems as required under the relevant legal framework.



## 3.3 Traditional governance

### Key points

- Traditional governance has an essential role in land and natural resources management in Pacific island countries and territories.
- The majority of land in the Pacific islands is customarily owned and is held in customary tenure. State lands or freehold lands represent only a comparatively small percentage of lands.
- Customary definition of land in most of the Pacific islands extends to the foreshore and inshore waters, although in some countries,

the national law vests ownership of foreshore lands to the State, while recognising customary rights of access and use by traditional landowners.

## Background and relevance of indicator

This indicator assesses the recognition of customary land ownership and customary rights of access and use of land and marine resources in each country. It identifies the percentage of land owned customarily and whether customary land ownership extends to foreshores and beyond. It also briefly covers the effect of customary ownership on environmental governance.

## How the indicator was assessed

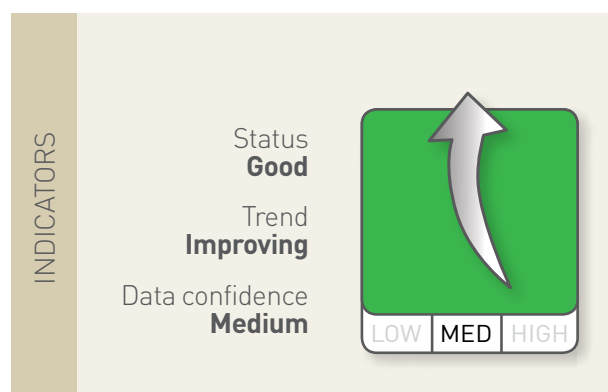
The data for Fiji's status of traditional governance were assessed through desktop research and extracted from the country profile on the Pacific Environment Information Network (PIEN) website (Secretariat of the Pacific Regional Environmental Programme (SPREP) 2013a) as well as government websites, published reports and various articles (Clarke et al. 2008).

## State

Customary ownership of land is recognised by the Constitution of the Republic of Fiji. The Forest Decree allows for the customary rights of native Fijians on native land and the right to exercise any rights established by native custom, such as hunting, fishing or collecting fruits and vegetables growing wild. Similarly, customary land owners are given rights of access and use of marine resources in Fiji. Furthermore, the Fisheries Act prescribes rights given to customary landowners to fish and collect shellfish without a permit within their respective mataqali fishing areas registered by the iTaukei Fisheries Commission in the Register of iTaukei Customary Fishing Rights. This policy is complimented by the Environmental Management Act, which provides recognition that indigenous people have historic relations with their land.

Further recognition of customary ownership and governance is catered for through the granting of access and use of land in several pieces of legislation exemplified by the Native Lands Act. iTaukei (Native) land comprises 87% of all the land in Fiji, which was permanently ceded by the British Crown in the 1880s. However, this cession is slightly tainted in terms of foreshore ownership. According to customary law, land includes the adjacent fishing grounds (*qoliqoli*); however, 'Crown Land' is defined differently: the Crown Lands Act states that the seabed and foreshore are species of Crown (or State) land, making this a grey area with no clear recognition of customary marine tenure either in a western legal sense or traditional communal sense. Thus, clearly marine tenure has never been granted the same status as land tenure in Fiji. The iTaukei Land Trust Board is mandated by statutory law to protect and manage land ownership rights assigned to iTaukei landowners and to facilitate the commercial transactions that revolve around the use of such land. Crown land, in contrast, is owned by the State through the Ministry of Lands, which regulates its usage.

A prominent feature of environmental governance in Fiji particularly is the Fiji Locally Managed Marine Areas (FLMMA), which, despite the ambiguity concerning ownership of marine areas, promotes and encourages the preservation, protection and sustainable use of marine resources in Fiji by the coastal land owners of marine resources in Fiji, including *qoliqolis* or traditional fishing grounds.



### 3.4 National Biodiversity Strategy and Action Plans and National reporting to the Convention on Biological Diversity

#### Key points

- Fourteen of the countries of the SPREP region are Parties to the Convention on Biological Diversity (CBD), and 12 have National Biodiversity Strategies and Action Plans (NBSAPs).
- National reporting to the CBD includes submission of national reports and thematic reports on various themes, such as alien species, protected areas, etc. Parties to the CBD have also submitted Action Plans for Implementing the Convention on Biological Diversity's Programme of Work on Protected Areas, known as PoWPA Action Plans.

#### Background and relevance of indicator

NBSAPs are the principal instruments for implementing the CBD at the national level. The Convention requires parties to prepare a National Biodiversity Strategy (or equivalent instrument) and to ensure that this strategy is mainstreamed into the planning and activities of all those sectors whose activities may have an effect (positive and negative) on biodiversity.

#### How the indicator was assessed

The Goals and Targets of the CBD Strategic Plan 2001–2010 were used to assess current NBSAPs (Government of Fiji 1998, 2001, 2007, 2010, 2011 and 2012) because Parties were required to report progress against them in their Fourth National Reports to the Secretariat of the CBD. Scores were then given to Targets within each Goal for each country.

*Note: The Strategic Plan on Biodiversity 2011–2020 and the Aichi Biodiversity Targets were adopted by the Parties to the CBD during the Tenth*

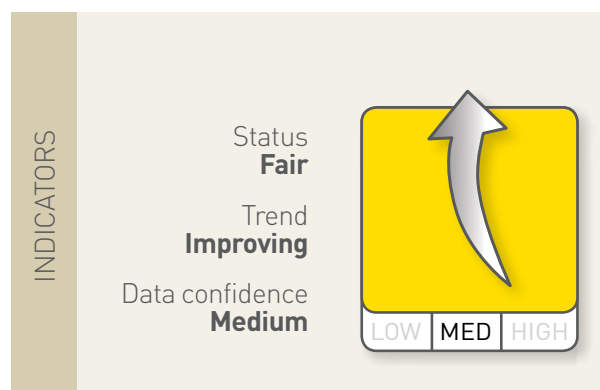
*Conference of the Parties (COP10) in Nagoya, Japan.*

*The fifth national report (scheduled for submission in early 2014) is to provide a mid-term review of progress toward the implementation of the Strategic Plan for Biodiversity 2011–2020 and progress toward the Aichi Biodiversity Targets. The fifth national report has not been considered for this assessment.*

#### State

Fiji's NBSAP addresses the goals of the CBD Strategic Plan 2001–2010 and was adopted by government in 2003. It addresses most of the Thematic Areas and some of the Cross-cutting Issues but has not been updated since its initial production and does not clearly address the Aichi Biodiversity Targets of the CBD Strategic Plan 2011–2020.

Considerable progress has been made toward meeting Goal 3 (Promote the conservation of genetic diversity) of the CBD Strategic Plan 2001–2010. Good progress has been made in many other areas, but Goal 2 (Promote the conservation of species diversity) may need more attention. Under-reporting of activities of the many effective NGOs in Fiji may be misrepresenting the level of achievement, and an improved monitoring and evaluation protocol with priorities, appropriate targets, indicators and timescales will help identify and report on progress.



**Table 14** Summary of reporting by Fiji to the CBD up to 2013

| NBSAP progress in Fiji  | Achieved |
|---|----------|
| NBSAP developed   | yes      |
| NBSAP with measurable targets                                     | no       |
| NBSAP with Indicators   | no       |
| NBSAP updated Post-Nagoya   | no       |
| First National Report to the CBD                                  | yes      |
| Second National Report to the CBD                                 | yes      |
| Third National Report to the CBD                                  | no       |
| Fourth National Report to the CBD                                 | yes      |
| Fifth National Report to the CBD                                  | no       |
| National Action Plan for the Programme of Work on Protected Areas | yes      |



# 4 Conservation initiatives

## 4.1 Protected areas

### Key points

- Coverage of the land and seas of Oceania by protected areas is low. Only four countries appear to have met the Aichi Target 11 commitment made through the CBD for terrestrial coverage, and just one has met the goal for marine coverage.
- There are no protected areas in international waters within the region.
- Locally Managed Marine Areas (LMMAs) contribute to biodiversity conservation, and their implementation by over 500 communities represents a unique achievement.
- Across Oceania, protection of both terrestrial and marine Important Bird Areas (IBAs) is very poor, with only 10% of the area of marine IBAs and 20% of the area of terrestrial IBAs encompassed within protected areas.
- Similarly, of the Alliance for Zero Extinction sites (AZE), which hold the last remaining populations of Critically Endangered or Endangered species, only three (8.1%) are completely protected, and eight (22%) are partially protected by inclusion in protected areas.

### Background and relevance of indicator

Protected areas are a key mechanism for conserving biodiversity. This indicator assesses the extent to which nationally designated protected areas, including Locally Managed Marine Community Areas (LMMAs) and other

sites of global significance for the conservation of biodiversity, such as Important Bird Areas (IBAs), Endemic Bird Areas (EBAs), Key Biodiversity Areas (KBAs) and Alliance of Zero Extinction Sites (AZE), provide terrestrial and marine coverage.

*Note: Gaps in information and listing of protected areas have been noted in the WDPA.*

### How the indicator was assessed

The analysis presented here relies on the official data supplied by the Government of Fiji and on data held in the World Database on Protected Areas (World Database on Protected Areas (WDPA) 2013), Birdlife International database (BirdLife International 2013a) and Alliance for Zero Extinction Sites database (Alliance for Zero Extinction Sites (AZE) 2013, Integrated Biodiversity Assessment Tool (IBAT) 2013).

### State

#### Terrestrial Protected Areas

Fiji has 829 square kilometres (4.3%) of its total terrestrial land (19,152 square kilometres) covered by Protected Areas (Integrated Biodiversity Assessment Tool (IBAT) 2013) (Table 15).

Table 15 Protected Area coverage in Fiji

| Protected Area           | Area (km <sup>2</sup> ) | Proportion (%) |
|--------------------------|-------------------------|----------------|
| Terrestrial/inland water | 829                     | 4.3%           |
| Coastal/Marine           | 11,911                  | 6.2%           |
| Total                    | 12,739                  | 6.0%           |

## Marine Protected Areas

Currently, Fiji has 11,911 square kilometres (6.2%) of coastal and marine areas covered by some form of Protected Areas.

There are currently 42 Designated and three proposed terrestrial and marine protected areas listed in the WDPA (Table 16).

**Table 16** Protected marine and terrestrial areas in Fiji

| Map No. | Name                                     | Designation                                      | IUCN category  | Marine | Marine area (km <sup>2</sup> ) | Total area (km <sup>2</sup> ) | Status       | Status year |
|---------|--|--|----------------|--------|--------------------------------|-------------------------------|--------------|-------------|
| 1       | Upper Navua Conservation Area            | Ramsar Site, Wetland of International Importance | Not applicable |        |                                | 6.2                           | Designated   | 2006        |
| 2       | Korotari                                 | Reserved Forest                                  | Ia             |        |                                | 10.9                          | Designated   |             |
| 3       | Ravilevu                                 | Nature Reserve                                   | Ia             | ✓      |                                | 40.2                          | Designated   | 1959        |
| 4       | Tomaniivi                                | Nature Reserve                                   | Ia             |        |                                | 13.2                          | Designated   | 1958        |
| 5       | Draunibota and Labiko Island             | Nature Reserve                                   | Ia             | ✓      | 0.86                           | 0.9                           | Designated   | 1959        |
| 6       | Vunimoli                                 | Nature Reserve                                   | Ia             |        |                                | 0.2                           | Designated   | 1966        |
| 7       | Nadarivatu                               | Nature Reserve                                   | Ia             |        |                                | 0.9                           | Designated   | 1956        |
| 8       | Naqarabuluti                             | Nature Reserve                                   | Ia             |        |                                | 2.8                           | Designated   | 1958        |
| 9       | Buretolu                                 | Reserved Forest                                  | Ia             |        |                                | 12.0                          | Designated   |             |
| 10      | Taveuni                                  | Reserved Forest                                  | Ia             |        |                                | 113.0                         | Designated   |             |
| 11      | Vuo Island                               | Nature Reserve                                   | Ia             | ✓      | 0.5                            | 0.5                           | Designated   | 1960        |
| 12      | Sigatoka Sand Dunes                      | National Park                                    | II             |        |                                | 6.5                           | Designated   | 1988        |
| 13      | Colo-I-Suva                              | Forest Park                                      | II             |        |                                | 0.9                           | Designated   | 1952        |
| 14      | Garrick Memorial                         | Nature Reserve                                   | IV             |        |                                | 4.3                           | Designated   | 1984        |
| 15      | Makogai Island                           | Marine Protected Area                            | IV             | ✓      | 8.4                            | 8.4                           | Designated   | 1987        |
| 16      | Yadua Taba Island Crested Iguana Reserve | Wildlife Sanctuary                               | IV             | ✓      | 0.77                           | 0.8                           | Designated   | 1980        |
| 17      | Lavena Coastal Walk                      | Recreational Reserve                             | V              | ✓      |                                |                               | Not Reported |             |
| 18      | Turtle Island MPA                        | Recreation Reserve                               | V              | ✓      |                                |                               | Not Reported |             |
| 19      | Wakaya Island                            | Recreational Reserve                             | V              | ✓      |                                | 8.0                           | Not Reported |             |
| 20      | Saweni Beach Amenity Reserve             | Recreational Reserve                             | V              |        |                                | 0.0                           | Designated   |             |

continued

Table 16 Protected marine and terrestrial areas in Fiji (continued)

| Map No. | Name   | Designation                       | IUCN category | Marine | Marine area (km <sup>2</sup> ) | Total area (km <sup>2</sup> ) | Status       | Status year |
|---------|--|-----------------------------------|---------------|--------|--------------------------------|-------------------------------|--------------|-------------|
| 21      | Yanuca (Malolo (Mamanuca Group)-Solevu/Yaro)                     | Locally Managed Marine Area       | VI            | ✓      | 68                             | 68.0                          | Designated   | 2003        |
| 22      | Cuvu Tikina  | Marine Project                    | VI            | ✓      | 1.7                            | 1.7                           | Designated   | 2000        |
| 23      | Wailevu/Galao/Soso villages                                      | Locally Managed Marine Area       | VI            | ✓      | 44.82                          | 44.8                          | Designated   | 2004        |
| 24      | Namenalala Island Resort   | Nature Reserve and Marine Reserve | VI            | ✓      | 0.42                           | 0.4                           | Designated   | 1987        |
| 25      | Sawaieke district-Vadravadra/Somosomo/Sawaieke/Nukuloa           | Locally Managed Marine Area       | VI            | ✓      | 149.72                         | 149.7                         | Designated   | 2002        |
| 27      | Manava Island  | Marine Protected Area             | VI            | ✓      |                                | 0.0                           | Designated   | 1992        |
| 28      | Bukatatanoa Barrier Reef   | Marine Protected Area             | VI            | ✓      |                                | 35.0                          | Not Reported |             |
| 29      | Moturiki-Daku/Niubasaga/Uluibau                                  | Locally Managed Marine Area       | VI            | ✓      | 82.7                           | 82.7                          | Designated   | 2000        |
| 30      | Mositi Vanuaso-Lamiti-Malawai/Lekanai/Nacavanadi/Naovuka/Vanuaso | Locally Managed Marine Area       | VI            | ✓      | 15.01                          | 15.0                          | Designated   | 2001        |
| 31      | Susui  | Not Reported                      | VI            | ✓      |                                | 6.5                           | Designated   |             |
| 32      | Tavarua Island   | Marine Protected Area             | VI            | ✓      |                                |                               | Not Reported |             |
| 33      | Vuna (Waitabu)   | Marine Protected Area             | VI            | ✓      |                                |                               | Designated   |             |
| 34      | Koroyanitu National  | Heritage Park                     | VI            |        |                                | 35.0                          | Designated   | 1996        |
| 35      | Ulunikoro Marine Reserve/Narikoso Village/Vabea Village          | Locally Managed Marine Area       | VI            | ✓      | 272.96                         | 273.0                         | Designated   | 1985        |
| 36      | Vuata Ono  | Marine Protected Area             | VI            | ✓      | 7.9                            | 7.9                           | Designated   | 1985        |
| 37      | Fulaga   | Marine Protected Area             | VI            | ✓      |                                |                               | Designated   |             |
| 40      | Bouma National Park  | Heritage Park                     | Not Reported  |        |                                | 150.0                         | Designated   | 1988        |

continued

Table 16 Protected marine and terrestrial areas in Fiji (continued)

| Map No. | Name                             | Designation           | IUCN category | Marine | Marine area (km <sup>2</sup> ) | Total area (km <sup>2</sup> ) | Status       | Status year |
|---------|----------------------------------|-----------------------|---------------|--------|--------------------------------|-------------------------------|--------------|-------------|
| 41      | Snake island (Labuco)            | Not Reported          | Not Reported  | ✓      |                                |                               | Not Reported |             |
| 42      | Namenalala Resort Marine Reserve | Marine Protected Area | Not Reported  | ✓      |                                | 0.4                           | Designated   | 1987        |
| 43      | Nukutolu Islets                  | Faunal Reserve        | Not Reported  | ✓      |                                |                               | Designated   |             |
| 44      | Ogea Levu                        | Faunal Reserve        | Not Reported  | ✓      |                                |                               | Designated   |             |
| 45      | Nanuku Islet                     | Faunal Reserve        | Not Reported  | ✓      |                                |                               | Designated   |             |
| 26      | Great Astrolobe Lagoon           | Marine Protected Area | VI            | ✓      |                                |                               | Proposed     | 1998        |
| 38      | Mount Tomanivi                   | National Park         | Not Reported  |        |                                | 33.0                          | Proposed     |             |
| 39      | Mount Evans Forest Park          | Forest Park           | Not Reported  |        |                                |                               | Proposed     |             |

### Community Conserved Areas, such as LMMAs

The South Pacific has experienced a proliferation of Marine Managed Areas (MMAs) in the last decade. The approaches being developed at national levels are built on a unique feature of the region—customary tenure and resource access—and make use of existing community strengths in traditional knowledge and governance, combined with a local awareness of the need for action (Government of Fiji 2010). The imposition of traditional systems of *tabu* to assist in conservation efforts is a significant governance feature in Fiji.

There has been an impressive rate of expansion of community managed marine areas known as Fiji Locally Managed Marine Areas (FLMMAs), supported by a national network of NGOs and government organisations (Govan et al. 2009).

In 2013, the FLMMA network included 415 *tabu* (protected) areas within 143 *qoliqolis*, covering about 965 square kilometres (FLMMA [Fiji Locally Managed Marine Area Network] 2013).

Community managed areas (which include MPAs) in Fiji have led to improvements in reef ecosystems, with the return or increasing

abundance of 100s of coastal species that had disappeared or declined in abundance over the past 50 years (Thaman et al. 2013). For example, in 2009–2012, a study was undertaken in Vanua Navakavu, 7 kilometres to the west of Suva in southeastern Viti Levu, to determine the status of marine biodiversity after the establishment of the Navakavu LMMA and associated marine protected area in 2001. The Navakavu fishery had become seriously degraded, and a wide range of formerly abundant species had virtually disappeared, mainly because of overfishing, exacerbated by increasing population, habitat degradation and pollution from inland soil erosion and nearby settlements. An assessment of close to 900 species revealed increased abundance and the return of many species since the 2001 establishment of the LMMA and associated MPA (Thaman et al. 2013).

Important Bird Areas (IBAs) and Endemic Bird Areas (EBAs)

Important Bird Areas (IBAs) are sites of global biodiversity conservation importance that are chosen using internationally agreed, objective, quantitative and scientifically defensible criteria. IBAs are selected because they may hold threatened birds, birds restricted to

**Table 17** Important Bird Areas in Fiji and % of area protected (Integrated Biodiversity Assessment Tool (IBAT) 2013)

| Site name                                     | IBA status | Terrestrial | Marine | Criteria         | % of area protected |
|---|------------|-------------|--------|------------------|---------------------|
| Rotuma <sup>1</sup>                           | confirmed  | Yes         | No     | A1, A2           | 0.0%                |
| Natewa/Tunuloa Peninsula <sup>1</sup>         | confirmed  | Yes         | No     | A1, A2           | 0.1%                |
| Wailevu/Dreketi Highlands <sup>1</sup>        | confirmed  | Yes         | No     | A1, A2           | 0.1%                |
| Taveuni Highlands <sup>1, 2</sup>             | confirmed  | Yes         | No     | A1, A2           | 52.3%               |
| Vatu-i-Ra <sup>1, 2</sup>                     | confirmed  | Yes         | Yes    | A4i, A4iii       | –                   |
| Greater Tomaniivi <sup>1</sup>                | confirmed  | Yes         | No     | A1, A2           | 13.8%               |
| Koroyanitu/Vaturu <sup>1</sup>                | confirmed  | Yes         | No     | A1, A2           | 20.5%               |
| Rairaimatuku Highlands <sup>1</sup>           | confirmed  | Yes         | No     | A1, A2           | 0.0%                |
| Sovi Basin <sup>1</sup>                       | confirmed  | Yes         | No     | A1, A2           | 48.2%               |
| Gau Highlands <sup>1, 2</sup>                 | confirmed  | Yes         | No     | A1, A2, A4ii     | 0.0%                |
| Viti Levu Southern Highlands <sup>1</sup>     | confirmed  | Yes         | No     | A1, A2           | 1.4%                |
| Nabukelevu <sup>1, 2</sup>                    | confirmed  | Yes         | No     | A1, A2           | 0.8%                |
| Ogea <sup>1</sup>                             | confirmed  | Yes         | No     | A1, A2           | 0.0%                |
| East Kadavu <sup>1</sup>                      | confirmed  | Yes         | No     | A1, A2           | 0.0%                |
| Vetauua <sup>2</sup>                          | proposed   | Yes         | Yes    | A4i              | –                   |
| Ringgold Islands Marine <sup>2</sup>          | proposed   | No          | Yes    | A4i, A4ii, A4iii | –                   |
| Qelelevu Islands <sup>2</sup>                 | proposed   | Yes         | Yes    | A4ii             | –                   |
| Nukubasaga and Nukupureti <sup>2</sup>        | proposed   | Yes         | Yes    | A4i, A4ii        | –                   |
| Taveuni Marine <sup>2</sup>                   | proposed   | No          | Yes    | A1, A4ii         | –                   |
| Kibobo Islet <sup>2</sup>                     | proposed   | Yes         | Yes    | A4ii             | –                   |
| Northern Lau Marine <sup>2</sup>              | proposed   | No          | Yes    | A4ii             | –                   |
| Namenelala <sup>2</sup>                       | proposed   | Yes         | Yes    | A1, A4ii         | –                   |
| Namenelala Marine <sup>2</sup>                | proposed   | No          | Yes    | A4ii             | –                   |
| Vatu-i-Ra Marine <sup>2</sup>                 | proposed   | No          | Yes    | A4i, A4iii       | –                   |
| Vatuvara <sup>2</sup>                         | proposed   | Yes         | Yes    | A1               | –                   |
| Mabualau and Saqata Rocks Marine <sup>2</sup> | proposed   | No          | Yes    | A4i, A4iii       | –                   |
| Mabualau and Saqata Rocks <sup>2</sup>        | proposed   | Yes         | Yes    | A4i              | –                   |
| Gau Marine <sup>2</sup>                       | proposed   | No          | Yes    | A1, A4ii         | –                   |
| Vanua Masi Islet <sup>2</sup>                 | proposed   | Yes         | Yes    | A4ii             | –                   |
| Vanua Masi Marine <sup>2</sup>                | proposed   | No          | Yes    | A4ii             | –                   |
| East Kadavu Passage <sup>2</sup>              | proposed   | No          | Yes    | A1, A4ii         | –                   |
| West Kadavu Marine <sup>2</sup>               | proposed   | No          | Yes    | A1, A4ii         | –                   |

<sup>1</sup> Masibalavu, VT and Dutson, G (2006). Important Bird Areas in Fiji: Conserving Fiji's natural heritage. Suva, Fiji: BirdLife International Pacific Partnership Secretariat. Most recent information available at <http://www.birdlife.org/datazone/sitesearch/> (accessed October 2013).

<sup>2</sup> <http://maps.birdlife.org/marinelBAs/default.html> (accessed October 2013).



particular regions or biomes, or significantly large populations of congregatory water birds. Through this process, sites directly important for bird conservation are identified and prioritised for conservation actions. In addition, birds have been shown to be extremely good indicators of overall biodiversity, and throughout the world, IBAs themselves protect a high percentage of many nations' total biodiversity [Stattersfield et al. 1998].

Thirteen IBAs are confirmed in Fiji, and an additional 19 sites have been proposed; see Table 17 for the complete list.

Over 2,500 bird species are restricted to a home area smaller than 50,000 square kilometres, and they are said to be endemic to it. BirdLife has identified regions of the world where the distributions of two or more of these restricted-range species overlap to form Endemic Bird Areas (EBAs).

Two EBAs are recognised in Fiji. The first includes all the Fijian islands with the exception of Rotuma. This EBA ranks third for numbers of restricted-range bird species in the Pacific and includes the Endangered long-legged thicketbird (*Trichocichla rufa*), and the Vulnerable pink-billed parrotfinch (*Erythrura kleinschmidt*), the Ogea monarch (*Mayrornis versicolor*), the crimson shining-parrot (*Prosopeia splendens*) and the shy ground-dove (*Gallinula storeri*). All the restricted-range species occur in forest, and some occur in man-modified habitats. Many species are widely distributed through the islands, but two are confined to Vanua Levu and Taveuni, three to Viti Levu and four to Kadavu. The Ogea Monarch *M. versicolor* is restricted to Ogea in the Lau archipelago, occurring on the two principal islands—Ogealevu (13 square kilometres) and Ogeadriki (5 square kilometres)—and on the smaller nearby Dakuiyanuya. Several of the more-widespread restricted-range species are shared with the Samoan Islands (EBA 203) and/or other Central Polynesian Secondary Areas (s127-s131), and a few occur to the west in Vanuatu (EBA 200) (BirdLife International 2013).

In addition to the restricted-range land birds, one seabird, the Fiji petrel *Pterodroma macgillivrayi*, is known only from Gau, where the number of recent observations has risen to eight, but where the breeding grounds,

presumed to be in forest, have yet to be located (Watling 1986, Watling and Gillison 1993 cited in BirdLife International 2013).

The Rotuma Secondary Area (S127) includes five endemic birds (BirdLife International 2013) shown in Table 18.

**Table 18** Endemic bird species in the Rotuma Island EBA

| Species   | IUCN Category |
|---|---------------|
| Purple-capped Fruit-dove ( <i>Ptilinopus porphyraceus</i> ) | LC            |
| Rotuma Myzomela ( <i>Myzomela chermesina</i> )              | VU            |
| Polynesian Triller ( <i>Lalage maculosa</i> )               | LC            |
| Fiji Shrikebill ( <i>Clytorhynchus vitiensis</i> )          | LC            |
| Polynesian Starling ( <i>Aplonis tabuensis</i> )            | LC            |

### Alliance for Zero Extinction Sites (AZEs)

The Alliance for Zero Extinction (AZE), a joint initiative of biodiversity conservation organisations from around the world, aims to prevent extinctions by identifying and safeguarding key sites, each one of which is the last remaining refuge of one or more Endangered or Critically Endangered species. AZE is first focusing on species that face extinction either because their last remaining habitat is being degraded at a local level or because their tiny global ranges make them especially vulnerable to external threats. To be designated as an AZE site, a site must meet at least three criteria: it must contain at least one Endangered (EN) or Critically Endangered (CR) species, as listed on the IUCN Red List; it must be the only area where an EN or CR species occurs and contain the overwhelmingly significant known resident population (>95%) of the EN or CR species; and it must have a definable boundary.

There are currently 5 recognised AZEs in Fiji (Table 19).

**Table 19 AZEs in Fiji and % of area protected (Integrated Biodiversity Assessment Tool (IBAT) 2013)**

| Site                           | Taxa    | Scientific name                     | Local and English name     | % of area protected |
|--------------------------------|---------|-------------------------------------|----------------------------|---------------------|
| Gau Highlands                  | Bird    | <i>Pseudobulweria macgillivrayi</i> | Kacau ni Gau, Fiji Petrel  | 0%                  |
| Mount Evans Range – Koroyanitu | Conifer | <i>Acropyle sahniana</i>            | Drautabua, –               | 0.60%               |
| Nausori Highlands              | Conifer | <i>Dacrydium nausoriense</i>        | Yaka, –                    | 0%                  |
| Taveuni Forest Reserve         | Mammal  | <i>Mirimiri acrodonta</i>           | –, Fijian Monkey-faced Bat | 68.30%              |
| Yadua Taba Island              | Reptile | <i>Brachylophus vitiensis</i>       | Vokai, Fiji Crested Iguana | 38.50%              |

### Key Biodiversity Areas (KBAs)

The KBA approach builds on and complements other conservation priority setting approaches by extending to all taxonomic groups the methodology employed by Bird Life International and Plant life International to identify Important Bird Areas (IBAs) and Important Plant Areas (IPAs), respectively. KBAs can be used as a tool by governments, inter-governmental organisations, NGOs, the private sector and other stakeholders to expand protected area networks and, more generally, for targeting conservation action. Additionally, KBAs provide the building blocks for landscape-level conservation planning and for maintaining effective ecological networks aimed at preventing biodiversity loss. In the Pacific, KBAs have been identified in three biodiversity hotspots, namely the Polynesia-Micronesia hotspot, the East Melanesia Islands hotspot and the New Caledonia hotspot, which collectively include all Pacific island countries and territories except for mainland PNG.

Fiji lies within the Polynesia-Micronesian Biodiversity Hotspot. In total, 32 KBAs are recognised in Fiji, including 10 marine IBAs, displayed in Table 20.

Priority locations for terrestrial protected areas have been identified in Fiji's NBSAP and include Tomainivi National Park, Monosavu-Nadrau Plateau and Koroyanitu on Viti Levu, Tunuloa Silktail Reserve, Vunivia and Waisali on Vanua Levu and the Taveuni Conservation Area (including Taveuni Forest Reserve, Ravilevu Nature Reserve and Bouma-Lavena Forest Park) on Taveuni Island (DoE 2007).

The Sovi Basin is the largest remaining undisturbed tract of lowland forest in Fiji. As an alternative to the logging and agricultural conversion that has decimated some of the country's other forests, Conservation International, the Fiji government and the local landowners agreed to use a conservation agreement to create new protected areas on land owned by traditional owners. The landowners will receive lease and royalty payments in return. In total, 20,000 hectares of the basin are now protected, conserving 11 different forest types and 10 endemic bird species, one of which is the endangered long-legged warbler (*Trichocichla rufa*), which was previously considered extinct and then re-discovered in Sovi only six years ago (Government of Fiji 2010). However, proposed development of the Namosi copper mine and construction of a dam by the Fiji Water Authority may threaten the protected area in the Sovi Basin if these proposals are successful.

### Ecologically or Biologically Significant Areas

Ecologically or Biologically Significant Areas (EBSAs) in the global marine realm are classified based on seven scientific criteria: 1. Uniqueness or rarity, 2. Special importance for life history of species, 3. Importance for threatened, endangered or declining species and/or habitats, 4. Vulnerability, fragility, sensitivity, slow recovery (fragile), 5. Biological productivity, 6. Biological diversity, and 7. Naturalness.

EBSAs recognised in Fiji are shown in Table 21.

Table 20 Key Biodiversity Areas in Fiji

| Island       | Site name   | Birds | Reptiles | Conifers | Other plants | Bats | Turtles |
|--------------|---|-------|----------|----------|--------------|------|---------|
| Gau          | Gau Highlands                                     | ✓     | ✓        |          | ✓            |      |         |
| Kadavu       | Gasele (East Kadavu)                              | ✓     |          |          | ✓            |      |         |
| Kadavu       | Nabukalevu/ Mt. Washington                        | ✓     |          |          | ✓            |      |         |
| Laucala      | Laucala Island                                    | ✓     |          |          |              | ✓    |         |
| Mamanucas    | Monuriki Island                                   |       | ✓        |          |              |      |         |
| Ovalau       | Ovalau Highlands                                  | ✓     | ✓        |          | ✓            |      |         |
| Rotuma       | Hatana Island                                     | ✓     |          |          | ✓            |      |         |
| Southern Lau | Kabara - Fulaga coastal vesi forest               | ✓     |          |          | ✓            |      |         |
| Southern Lau | Ogea  | ✓     |          |          | ✓            |      |         |
| Southern Lau | Vuaqava Island                                    | ✓     |          |          |              |      | ✓       |
| Vanua Levu   | Mt. Sorolevu                                      |       |          |          | ✓            |      |         |
| Vanua Levu   | Naicobocobo dry forests                           | ✓     |          |          | ✓            |      |         |
| Vanua Levu   | Nasigasiga  |       |          |          | ✓            |      |         |
| Vanua Levu   | Taveuni Forest Reserve                            | ✓     | ✓        |          | ✓            |      |         |
| Vanua Levu   | Udu Point   |       | ✓        |          | ✓            |      |         |
| Vanua Levu   | Vunivia Catchment                                 | ✓     | ✓        |          | ✓            |      |         |
| Vanua Levu   | Waisali Dakua National Trust Forest Reserve       | ✓     | ✓        |          |              |      |         |
| Vanua Levu   | Yadua Taba Island                                 | ✓     | ✓        |          |              |      |         |
| Viti Levu    | Colo-i-Suva Reserve                               |       |          |          | ✓            |      |         |
| Viti Levu    | Monasavu-Nadrau plateau                           | ✓     | ✓        |          |              | ✓    |         |
| Viti Levu    | Mt. Korobaba and Waimanu Watershed                | ✓     |          |          | ✓            |      |         |
| Viti Levu    | Mt. Evans Range - Koroyanitu                      | ✓     |          | ✓        | ✓            |      |         |
| Viti Levu    | Nakauvadra Range                                  | ✓     | ✓        |          |              |      |         |
| Viti Levu    | Nakorotubu Forest                                 | ✓     | ✓        |          |              |      |         |
| Viti Levu    | Namosi Highlands                                  | ✓     | ✓        | ✓        | ✓            |      |         |
| Viti Levu    | Natewa Peninsula                                  | ✓     | ✓        |          | ✓            |      |         |
| Viti Levu    | Nausori Highlands                                 | ✓     | ✓        | ✓        | ✓            |      |         |
| Viti Levu    | Navua Gorge                                       | ✓     | ✓        |          | ✓            |      |         |
| Viti Levu    | Serua forest wilderness                           | ✓     | ✓        | ✓        | ✓            |      |         |
| Viti Levu    | Sovi Basin Reserve                                | ✓     | ✓        | ✓        | ✓            |      |         |
| Viti Levu    | Tomaniivi- Wabu Nature and Forest Reserve complex | ✓     | ✓        | ✓        | ✓            |      |         |
| Viti Levu    | Vatia Peninsula                                   | ✓     |          |          |              |      |         |

List of sites extracted in October 2013 from [http://www.cepf.net/where\\_we\\_work/regions/asia\\_pacific/polynesia\\_micronesia/ecosystem\\_profile/Pages/default.aspx](http://www.cepf.net/where_we_work/regions/asia_pacific/polynesia_micronesia/ecosystem_profile/Pages/default.aspx)

Table 21 Ecologically or Biologically Significant Areas (EBSAs) in Fiji

| Name of areas meeting EBSA criteria                         | Country                        | Area (km <sup>2</sup> ) |
|---|--------------------------------|-------------------------|
| 5 Kadavu and the Southern Lau Region                        | Fiji                           | 212,182                 |
| 14 Vatu-i-Ra/Lomaiviti, Fiji                                | Fiji                           | 24,828                  |
| 22 Taveuni and Ringgold Islands                             | Fiji                           | 18,410                  |
| 13 South of Tuvalu/Wallis and Fortuna/North of Fiji Plateau | Tuvalu/Fiji/Wallis and Fortuna | 325,000                 |

### Protected Area Coverage

In summary, 4.3% of terrestrial and 6.2% of coastal and marine areas in Fiji are covered by some form of protected area, as shown in the World Database of Protected Areas (Integrated Biodiversity Assessment Tool (IBAT) 2013).

Priority Sites within Fiji include:

- 5 AZEs covering 556 square kilometres;
- 32 IBAs (13 confirmed and 19 proposed sites) encompassing 22 terrestrial IBAs covering 3,116 square kilometres and 10 marine IBAs covering 57,020 square kilometres.

Protected Area coverage of AZEs is shown in Table 22 and indicates that 2 of the 5 AZEs are partially covered by Protected Areas, and the remaining three have no Protected Area status. In total, 105 square kilometres (18.9%) of AZEs are covered by Protected Areas.

An indication of protected area coverage of KBAs is shown in Table 23 (Integrated Biodiversity Assessment Tool (IBAT) 2013) based on analysis undertaken in 2013 by UNEP-WCMC of the data held in the World Database of Protected Areas (WDPA). The analysis was undertaken using the January 2013 release of the WDPA, the 2010 update for AZEs and the March 2013 spatial dataset for IBAs. KBAs identified as part

Table 22 Protected Area coverage of AZEs in Fiji

| Level of protected area coverage     | AZEs  | Terrestrial/<br>inland water AZEs | Coastal/Marine AZEs |
|--------------------------------------|-------|-----------------------------------|---------------------|
| Number of KBAs                       | 5     | 4                                 | 1                   |
| % KBAs with complete (>98%) coverage | 0.0%  | 0.0%                              | 0.0%                |
| % KBAs with partial coverage         | 40.0% | 50.0%                             | 0.0%                |
| % KBAs with no (<2%) coverage        | 60.0% | 50.0%                             | 100.0%              |
| Mean % area of each KBA covered      | 21.5% | 26.8%                             | 0.0%                |

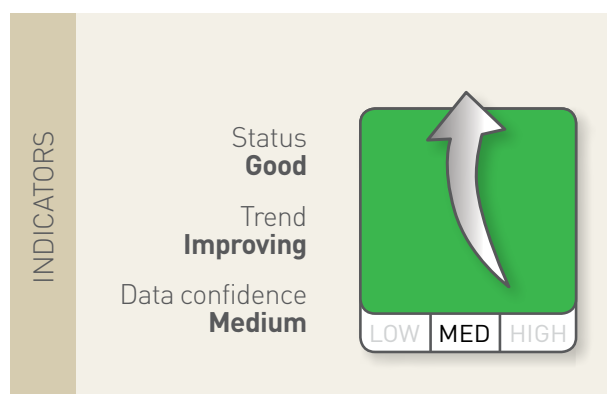
(Integrated Biodiversity Assessment Tool (IBAT) 2013)

Table 23 Protected Area coverage of Key Biodiversity Areas (KBAs) in Fiji

| Level of protected area coverage     | All KBAs | Terrestrial/<br>inland water KBAs | Coastal/Marine KBAs |
|--------------------------------------|----------|-----------------------------------|---------------------|
| Number of KBAs                       | 18       | 13                                | 5                   |
| % KBAs with complete (>98%) coverage | 0.0%     | 0.0%                              | 0.0%                |
| % KBAs with partial coverage         | 33.3%    | 38.5%                             | 20.0%               |
| % KBAs with no (<2%) coverage        | 66.7%    | 61.5%                             | 80.0%               |
| Mean % area of each KBA covered      | 13.6%    | 14.7%                             | 10.6%               |

(Integrated Biodiversity Assessment Tool (IBAT) 2013)

of the CEPF hotspot profiling process were not included unless they are also an IBA or AZE site (Integrated Biodiversity Assessment Tool (IBAT) 2013).



## 4.2 Conservation initiatives

### Participation in non-governmental conservation initiatives

Non-government organisations (NGOs), both local and international, participate effectively in conservation initiatives throughout the Pacific, and their presence in Fiji is equally important in supporting the Government's role in biodiversity conservation. Appendix C attached below outlines the conservation initiatives of NGOs in Fiji.

### Conservation of species and sites

Fiji has taken steps toward better species governance by ratifying several MEAs (see Table 13). With the increase of commercial infrastructural developments in Fiji, habitats and species living in these habitats are threatened with extinction or change in status from resident to migratory species. These threats may be mitigated through better land-use planning, proper environmental impact-assessment processes, proper management of waste and pollution, sustainable forestry and mining activities and better mitigation of climate change and disaster impacts. Appendix D attached indicates the specific legal framework, institutional arrangement and strategy or action

plans, if any, by which these mitigating factors are governed.

### Invasive Alien Species Management

The National Biodiversity Strategy and Action Plan (NBSAP) includes invasive species in *FOCUS 5: Management of Invasive Species* with four Objectives (5.1 Reduce risks of the introduction of invasive species, 5.2 Effectively control invasive and potentially invasive species present in Fiji, 5.3 Develop inter-island quarantine awareness and enforcement for important biodiversity, and 5.4 Ensure national and government awareness and participation in the current international Biosafety protocol discussions and debate).

The Implementation Framework 2010–14 for the National Biodiversity Strategy and Action Plan 2007 addresses invasives in *THEMATIC AREA 2: Invasive Alien Species* with two Objectives (1. Identify and document those invasive species that constitute major threats to Fiji's main natural and cultural ecosystems and biodiversity; 2. To use this information to develop a draft National Invasive Species plan to prohibit the introduction of new invasive alien species and to eradicate or control existing species identified during the planning of the project). Fiji does not have a National Invasive Species Strategy and Action Plan.

The SPREP Guidelines for Invasive Species Management (Secretariat of the Pacific Regional Environmental Programme (SPREP) 2009) in the Pacific provide a sound framework for countries to use in developing invasive species management programmes.

Several initiatives have been undertaken to address the nine Thematic Areas of the three Sections of the *Guidelines for Invasive Species Management in the Pacific* (A. Foundations, B. Problem Definition, Prioritisation and Decision-Making, C. Management Action). Government-level efforts have been focused on recent incursions of Asian subterranean termites (*Coptotermes gestroi*) and American iguana (*Iguana iguana*). Both local and national government and civil society agencies are involved in awareness-raising and capacity development activities.

NGOs (such as National Trust of the Fiji Islands, NatureFiji-MareqetiViti and BirdLife

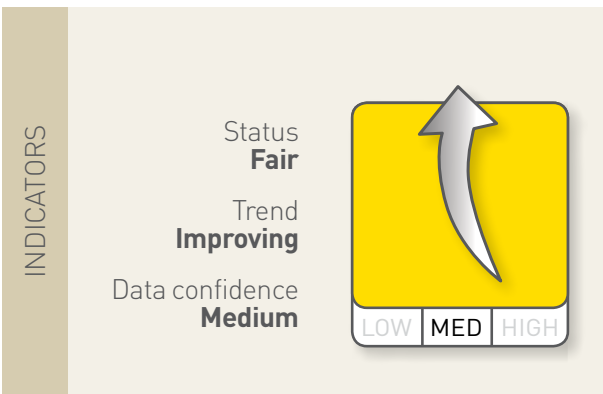


International) and communities have worked together on site-based projects, including invasive plant management and eradications of goats, cats and rats at priority biodiversity sites. These efforts have helped protect iconic species such as the Fijian crested iguana (*Brachylophus vitiensis*) and the Fiji petrel (*Pseudobulweria macgillivray*) as well as a range of terrestrial and marine birds. BirdLife has worked with communities to establish an innovative regional network of practitioners and experts.

The Biosecurity Authority of Fiji (BAF) is a Commercial Statutory Authority established under the Biosecurity Promulgation in December 2008. BAF’s mandate is to protect Fiji’s agricultural sector from the introduction and spread of animal and plant pests and diseases, facilitate access to viable agro-export markets and ensure compliance of Fiji’s agro-exports to overseas market requirements. The Biosecurity Promulgation defines ‘biosecurity’ as “the control by legal and administrative means of pests and diseases affecting animals, plants and their products, in order to avoid adverse effects from such pests and diseases on the economy and health of the Fiji Islands”, and, as with other Pacific nations, it is not clear how the legislation provides protection for the natural environment.

Ongoing issues

- Awareness programs have been implemented by various stakeholders in an ad hoc manner and are designed for their focus species and to suit their respective audiences.
- There are many government and NGO partnerships; however, there is no lead agency in Communication, Education, Participation and Awareness (CEPA) Programme work.
- Island biosecurity is still a challenge.





Qamea Island, Fiji  
Image credit: Stuart Chape





Suva fish market.  
Photo credit: Sangeeta Mangubhai.

## ADDENDA

|   |    |
|---|----|
| 5 Summary and conclusions   | 60 |
| 6 References  | 63 |
| Appendix A: Ratification of International Conventions and related regional and national frameworks, policies and legislation in Fiji                                    | 68 |
| Appendix B: National Governance – Governance of terrestrial and marine ecosystems   | 70 |
| Appendix C: Legislation addressing key threats to habitats in Fiji  | 71 |
| Appendix D: Non-governmental conservation initiatives in Fiji   | 73 |
| Appendix E: Legislation in Fiji relating to species conservation – legal frameworks, institutional arrangements and strategies in place related to species conservation | 75 |

# 5 Summary and conclusions

This analysis has used a set of indicators to assess the current state of conservation in Fiji. These indicators are summarised in Table 24. Progress in relation to meeting the Aichi Targets has also been analysed in relation to this set of indicators; Table 25 maps the indicators with the relevant Aichi Targets.

**Table 24** Summary of indicator assessments for Fiji

**a. State, pressure and threats**

|                |         |                          | Status |                       |               |              |
|----------------|---------|--------------------------|--------|-----------------------|---------------|--------------|
| Topic          | Section | Indicator                | State  | Pressures and threats | Trend         | Data quality |
| ECOSYSTEMS     |         |                          |        |                       |               |              |
| Terrestrial    | 1.1     | Forest cover             | Fair   | Fair                  | Deteriorating | Medium       |
| Freshwater     | 1.2     | Freshwater ecosystems    | Fair   | Fair                  | Deteriorating | Medium       |
| Coastal        | 1.3.1   | Coral reef               | Fair   | Fair                  | Mixed         | Medium       |
|                | 1.3.2   | Mangrove ecosystem       | Good   | Fair                  | Deteriorating | Medium       |
|                | 1.3.3   | Seagrass beds            | Fair   | Fair                  | Mixed         | Medium       |
| Marine         | 1.4.1   | Ocean health             | Fair   | Fair                  | Mixed         | Medium       |
|                | 1.4.2   | Utilised species         | Fair   | Fair                  | Deteriorating | High         |
| SPECIES        |         |                          |        |                       |               |              |
| Native species | 2.1     | Threatened species       | Fair   | Fair                  | Mixed         | Medium       |
|                | 2.2     | Endemic species          | Fair   | Fair                  | Mixed         | Medium       |
|                | 2.3     | Migratory marine species | Fair   | Poor                  | Deteriorating | Medium       |

**b. Response**

| Topic                    | Section | Indicator                                       | Status | Trend     | Data Quality |
|--------------------------|---------|---|--------|-----------|--------------|
| Environmental governance | 3.1     | Multilateral Environmental Agreements           | Good   | Improving | High         |
|                          | 3.2     | National policies and legislation               | Fair   | Improving | Medium       |
|                          | 3.3     | Traditional governance                          | Good   | Improving | Medium       |
|                          | 3.4     | National Biodiversity Strategy and Action Plans | Fair   | Improving | Medium       |
| Conservation initiatives | 4.1     | Protected area coverage                         | Good   | Improving | Medium       |
|                          | 4.2     | Conservation initiatives                        | Fair   | Improving | Medium       |



Table 25 Mapping of AICHI biodiversity targets with indicators in this assessment

| Aichi Biodiversity Target  | Target # | Indicator  |
|--|----------|--|
| By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.   | 5        | Terrestrial ecosystems:<br>Forest cover  |
| By 2020, all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem-based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems, and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits. | 6        | Marine ecosystems: Ocean health and Utilised species<br>Coastal ecosystems: Coral reefs, Mangrove ecosystems and Seagrass beds |
| By 2020, areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.   | 7        | Terrestrial ecosystems:<br>Forest cover<br>Freshwater ecosystems   |
| By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.   | 8        | Marine ecosystems: Ocean health and Utilised species<br>Freshwater ecosystems  |
| By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.  | 9        | Conservation initiatives:<br>Invasive alien species management   |
| By 2015, the multiple anthropogenic pressures on coral reefs and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, to maintain their integrity and functioning.   | 10       | Marine ecosystems: Ocean health and Utilised species<br>Coastal ecosystems: Coral reefs, Mangrove ecosystems and Seagrass beds |
| By 2020, at least 17% of terrestrial and inland water and 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures and are integrated into the wider landscapes and seascapes.                        | 11       | Conservation initiatives:<br>Protected area coverage   |
| By 2020, the extinction of known threatened species has been prevented, and their conservation status, particularly of those most in decline, has been improved and sustained.   | 12       | Native species: Threatened species, Endemic species, Endangered marine migratory species                                       |

continued

**Table 25 Mapping of Aichi Biodiversity Targets with indicators used in this assessment (continued)**

| Aichi Biodiversity Target  | Target # | Indicator   |
|--|----------|---|
| By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.  | 14       | Terrestrial ecosystems<br>Freshwater ecosystems<br>Marine ecosystems: Ocean health and Utilised species<br>Coastal ecosystems: Coral reefs, Mangrove ecosystems and Seagrass beds |
| By 2015, each Party has developed, adopted as a policy instrument and commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.   | 17       | Environmental governance: National Biodiversity Strategy and Action Plans   |
| By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels. | 18       | Environmental governance: Traditional governance  |

# 6 References

Abell R., Allan J.D. and Lehner B. 2007. Unlocking the potential of protected areas for freshwaters. *Biological Conservation* 134:48-63.

Alliance for Zero Extinction Sites (AZE). 2013. Alliance for Zero Extinction Sites.

Anderson P., Lepa F. and Sione T. 2013. Vavau Mangrove Survey. Ministry of Environment and Climate Change, Kingdom of Tonga.

Anon. 2009. Cook Islands - National Fisheries Report. WCPFC-SC5-AR/CCM-04, Fifth Scientific Committee Meeting, Western and Central Pacific Fisheries Commission, Port Vila.

Anon. 2013. Cook Islands Annual Report to the Commission - Part 1: Information on Fisheries, Research, and Statistics. Scientific Committee, Ninth Regular Session, Western and Central Fisheries Commission, Pohnpei.

Atherton J., Olson D., Farley L. and Qauqau I. 2006. Watershed Assessment for Healthy Reefs and Fisheries: Fiji Watersheds at Risk. Technical Report submitted to the Fiji Department of Environment and Fiji Department of Fisheries by the Wildlife Conservation - South Pacific, Suva, Fiji.

BirdLife International. 2013. BirdLife Datazone.

Boseto D. 2006. Freshwater fish of Sovi Basin. In: Morrison, C. (ed) Third Fauna and Flora Survey and Establishment of Long-term Monitoring Plots in the Sovi Basin, Naitasiri 20th - 31st March, 2006. Institute of Applied Sciences, University of the South Pacific, Suva.

Brooke M.d.L. and Hepburn I. 1992. The Wetlands of the Pitcairn Islands. Used with permission of Wetlands International.

Bryant D., Burke L., McManus L. and Spalding M. 1998. Reefs at Risk: A Map-Based Indicator of Threats to the World's Coral Reefs. A joint publication by World Resources Institute (WRI), International Center for Living Aquatic Resources Management (ICLARM), World Conservation Monitoring Centre (WCMC), United Nations Environment Programme (UNEP). World Resources Institute.

Chassot E., Dubroca L., Delgado de Molina A., Assan C., Soto M., Floch L. and Fonteneau A. 2012. Decomposing Purse Seine CPUEs to Estimate an Abundance Index for Yellowfin Free-swimming Schools in the Indian Ocean during 1981-2011. Victoria: IOTC.

Chin A., Lison De Loma T., Reyta K., Planes S., Gerhardt K., Clua E., Burke L. and Wilkinson C. 2011. Status of Coral Reefs of the Pacific and Outlook: 2011. Global Coral Reef Monitoring Network.

Clarke P., Millar I. and Sollberger K. 2008. Capacity Building for Environmental Law in the South Pacific. Gland, Switzerland: IUCN.

Coles R., Grech A., Rasheed M., McKenzie L., Unsworth R. and Short F. 2011. Seagrass Ecology and Threats in the Tropical Indo-Pacific Bioregion, Chapter 9. In: Pirog R. (ed) Seagrass: Ecology, Uses and Threats. ISBN 978-1-612761-987-8.

Convention on Migratory Species (CMS). Convention on the Conservation of Migratory Species of Wild Animals.

Coral Reef Research Foundation. 2012. Palau Dugong dugong Awareness Campaign 2010-2011.

Craig P., Parker D., Brainard R., Rice M. and Balazs G. 2004. Migrations of Green Turtles in the Central South Pacific *Biological Conservation* 116:433-438.

Cushing C.E., Cummins K.W. and Minshall G.W. 1995. River and Stream Ecosystems of the World. *Ecosystems of the World*, Vol 22. Amsterdam: Elsevier.

Duke N.C., Mackenzie J., and Wood A. 2012. A Revision of Mangrove Plants of the Solomon Islands, Vanuatu, Fiji, Tonga and Samoa: A Report for the MESCAL Project, IUCN Oceania Office, Suva. Report 12/13. 25p.

ECOLEX. 2013. The Gateway to Environmental Law. Available at <http://www.ecolex.org>.

Ellison A.M., Farnsworth E.J. and Merkt R.E. 1999. Origins of Mangrove Ecosystems and the Mangrove Biodiversity Anomaly. *Global Ecology and Biogeography* 8:95-115.



- Ellison J.C. 2010. Vulnerability of Fiji's Mangroves and Associated Coral Reefs to Climate Change. WWF South Pacific Programme.
- Eriksen M., Maximenko N., Thiel M., Cummins A., Lattin G., Wilson S., Hafner J., Zellers A. and Rifman S. 2013. Plastic Pollution in the South Pacific Subtropical Gyre. *Marine Pollution Bulletin* 68:71-76.
- Fiji Locally Managed Marine Areas (FLMMA). 2013. Fiji Locally Managed Marine Areas (FLMMA).www.Immanetwork.org
- Food and Agriculture Organisation of the United Nations (FAO). 2005. Fiji Islands Country Profile. Thematic Study on Mangroves. Global Forest Resources Assessment. Rome: FAO.
- Food and Agriculture Organisation of the United Nations (FAO). 1995. Solomon Islands National Forest Resource Inventory. Rome: FAO.
- Food and Agriculture Organisation of the United Nations (FAO). 2010. Global Forest Resources Assessment FAO Forestry Paper 163. Rome: FAO.
- Food and Agriculture Organisation of the United Nations (FAO). 2012. The State of World Fisheries and Aquaculture. Rome: FAO.
- Forum Fisheries Agency (FFA). 1993. Cook Islands Fisheries Resources Profiles. FFA Report No.93/25, Forum Fisheries Agency, Honiara.
- Garrigue C., Patenaude N. and Marsh H. 2008. Distribution and Abundance of the Dugong in New Caledonia, Southwest Pacific. *Marine Mammal Science* 24:81-90.
- Gassel M., Harwani S., Park J.-S. and Jahn A. 2013. Detection of Nonylphenol and Persistent Organic Pollutants in Fish from the North Pacific Central Gyre. *Marine Pollution Bulletin* 73:231-242.
- Gehrke P.C., Sheaves M.J., Figa B.S., Boseto D.T., Terry J.P. and Ellison J.C. 2012. Vulnerability of Freshwater Habitats and Fisheries to Climate Change in the Tropical Pacific. Proceedings of the 9th International Symposium on Ecohydraulics, 17-21 September 2012, Vienna, Austria, p. 1-8.
- Gillett R. 2009. Fisheries in the Economies of Pacific Island Countries and Territories. Pacific Studies Series, Asian Development Bank, World Bank, Forum Fisheries Agency, Secretariat of the Pacific Community, and Australian Agency for International Development.
- Gillett R. 2011. Fisheries of the Pacific Islands: Regional and National Information. FAO Regional Office for Asia and the Pacific, Bangkok Thailand. RAP Publication 2011/01.290.
- Govan H. 2009. Status and Potential of Locally-managed Marine Areas in the South Pacific: Meeting Nature Conservation and Sustainable Livelihood Targets through Wide-spread Implementation of LMMAs. SPREP/WWF/WorldFish-Reef ase/CRISP. 95 pp.
- Govan H., Tawake A., Tabunakawai K., George S., Alefaio S., Troniak S., Maltali T., Tafea H., Walton H., Bartlett C. and Jenkins A. 2009. Community Conserved Areas: A Review of Status and Needs in Melanesia and Polynesia. ICCA regional review for ENESTA/TILCEPA/TGER/IUCN/GEF-SGP. Gland, Switzerland: IUCN.
- Government of Fiji. 1998. Republic of Fiji - First National Report to the Conference of the Parties-Convention on Biological Diversity (CBD).
- Government of Fiji. 2001. Republic of Fiji - Second National Report to the Conference of the Parties-Convention on Biological Diversity (CBD).
- Government of Fiji. 2007. Fiji National Biodiversity Strategy and Action Plan- submitted to the Convention on Biological Diversity (CBD).
- Government of Fiji. 2010. Republic of Fiji - Fourth National Report to the Conference of the Parties-Convention on Biological Diversity (CBD).
- Government of Fiji. 2011. Fiji Programme of Work on Protected Areas (PoWPA) Action Plan.
- Government of Fiji. 2012. Implementation Framework- 2010-2014 for the National Biodiversity Strategy and Action Plan 2007. Fiji Islands.
- Graham M. 2013. Fiji State of Environment Report 2013 (in prep) Fiji Government, Department of Environment.
- Harley S.J., Berger A.M., Pilling G.M., Davies N. and Hampton J. 2012. Evaluation of Stock Status of South Pacific Albacore, Bigeye, Skipjack and Yellowfin Tunas and Southwest Pacific Striped Marlin against Potential Limit RPs. MOW1-IP-04. WCPFC Management Objectives Workshop report.
- Herr D. and Galland G.R. 2009. The Ocean and Climate Change. Tools and Guidelines for Action. Gland, Switzerland: IUCN.

- InforMEA. 2014. United Nations Information Portal on Multilateral Environmental Agreements (MEAs).
- Integrated Biodiversity Assessment Tool (IBAT). 2013. Protected Area and Key Biodiversity Area data downloaded from the Integrated Biodiversity Assessment Tool (IBAT) (<http://www.ibatforbusiness.org>). Provided by BirdLife International, Conservation International, IUCN and UNEP-WCMC. Please contact [ibat@birdlife.org](mailto:ibat@birdlife.org) for further information.
- International Programme on the State of the Ocean. 2013. The State of the Ocean 2013: Perils, Prognoses and Proposals.
- International Union for Conservation of Nature (IUCN). 2008. Summary of Species on the 2008 IUCN Red List - Oceania. Gland, Switzerland: IUCN.
- International Union for Conservation of Nature (IUCN). 2012. The Current Status and Distribution of freshwater fishes, land snails and reptiles in the Pacific Islands of Oceania. Gland, Switzerland: IUCN.
- International Union for Conservation of Nature (IUCN). 2013. IUCN Red List of Threatened Species. Gland, Switzerland: IUCN.
- Jenkins A.P., Jupiter S.D., Qauqau I. and Atherton J. 2010. The Importance of Ecosystem-based Management for Conserving Aquatic Migratory Pathways on Tropical High Islands: A Case Study from Fiji. *Marine and Freshwater Ecosystems* 20:224-238.
- Jupiter S., Jenkins A., Koto K., Ah Tong J., Bwebe T., Cakacaka A., Dulunaqio S., Fox M., Kuritani L., Mario S., Naisilisili N., Nand Y., Tukana A., Weeks R., and Yakub N. 2012. Effects of Alteration to Catchment and Streams on Freshwater Fish Communities of Vanua Levu, Fiji. Suva, Fiji: Wildlife Conservation Society.
- Keith P., Marquet G., Gerbeaux P., Vigneux E. and Lord C. 2013. Freshwater Fish and Crustaceans of Polynesia: Taxonomy, Ecology, Biology and Management. Societe Francaise d'Ichtyologie.
- Lal P.N. 1991. Mangrove Management Issues: Strategies Adopted in the Pacific Islands. Canberra: Islands/Australian Working Paper No. 91/3, National Centre for Development Studies, ANU.
- Lovell E.R. and Sykes H.R. 2004. Status of Coral Reefs in Fiji. In: Sulu R (ed) Status of Coral Reefs in the SouthWest Pacific: 2004. p 1-81. Suva, Fiji: IPS Publications, University of the South Pacific 2007 ISBN 978-982-02-0386-0.
- Marsh H., Penrose H., Eros C. and Hugues J. 2002. Dugong Status Report and Action Plans for Countries and Territories. United Nations Environment Programme Division of Early Warning and Assessment.
- Masibalavu V.T. and Dutson G. 2006. Important Bird Areas in Fiji: Conserving Fiji's natural heritage. Suva, Fiji: BirdLife International Pacific Partnership Secretariat.
- Miller C. 2007. Current Knowledge of Cetacean Threats, Diversity and Habitats in the Pacific Islands Region. Whale and Dolphin Conservation Society Australasia. 98p.
- Miller C. and Prideaux M. 2013. Proactive Cetacean Conservation in the Midst of "Data Deficiency": Knowledge of Cetacean Threats, Diversity and Habitat in the Pacific Islands Region. Progress of the Convention on Migratory Species Cetacean Agreement in the Pacific Islands. Second Meeting of the Signatories, Auckland, NZ 28-29 July 2009. UN Doc. UNEP/CMS/PIC2/Inf.6-01 (15 July 2009).
- Ministry of Marine Resources (MMR). 2000. Basic Information on the Marine Resources of the Cook Islands. Rarotonga, Cook Islands: Ministry of Marine Resources.
- Morgan A., Carlson J., Ford T., Siceloff L., Hale L., Allen M.S. and Burgess G. 2009. Temporal and Spatial Distribution of Fish Bycatch in the US Atlantic Bottom Longline Shark Fishery. *Marine Fisheries Review* 72:34-38.
- Olson D., Farley L., Patrick A., Watling D., Tuiwawa M., Masibalavu V., Lenoa L., Bogiva A., Qauqau I., Atherton J., Caginitoba A., Tokota'a M., Prasad S., Naisilisili W., Raikabula A., Mailautoka K., Morley C. and Allnutt T. 2009. Priority Forests for Conservation in Fiji: Landscapes, Hotspots and Ecological Processes. *Oryx* 44:57-70.
- Pacific Islands Legal Information Institute (PACLI). 2013.
- Pitcher T.J. and Cheung W.W.L. 2013. Fisheries: Hope or Despair. *Marine Pollution Bulletin* 74:505-516.
- Polidoro B.A., Elfes C.T., Sanciangco J.C., Pippard H. and Carpenter K.E. 2011. Conservation Status of Marine Biodiversity in Oceania: An Analysis of Marine Species on the IUCN Red List of Threatened Species. *Journal of Marine Biology* 2011:247030.

- Pratchett M.S., Munday P.L., Graham N.A.J., Kronen M., Pinca S., Friedman K., Brewer T.D., Bell J.D., Wilson S.K., Cinner J.E., Kinch J.P., Lawton R.J., Williams A.J., Chapman L., Magron F. and Webb A. 2011. Vulnerability of Coastal Fisheries in the Tropical Pacific to Climate Change. In: Bell J.D., Johnson J.E. and Hobday A.J. (eds) *Vulnerability of Tropical Pacific Fisheries and Aquaculture to Climate Change*, p. 493–576. Noumea, New Caledonia: Secretariat of the Pacific Community.
- Rogers A.D. and Laffoley D. 2013. Introduction to the Special Issue; Interactions between Stresses, Impacts and Some Potential Solutions. Synthesis papers from the International Programme on the State of the Ocean 2011 and 2012 Workshops. *Marine Pollution Bulletin* 74:491–494.
- Schabetsberger R., Drozdowski G., Rott E., Lenzenweger R., Jersabek C.D., Fiers F., Traunspurger W., Reiff N., Stoch F., Kotov A.A., Martens K., Schatz H. and Kaiser R. 2009. Losing the Bounty? Investigating Species Richness in Isolated Freshwater Ecosystems of Oceania. *Pacific Science* 63:153–179.
- Scott D.A. 1993. *A Directory of Wetlands in Oceania*. Fiji. Slimbridge International Waterfowl and Wetlands Research Bureau and Kuala Lumpur: Asian Wetland Bureau (AWB).
- Secretariat of the Pacific Regional Environment programme (SPREP). 2007. Secretariat of the Pacific Regional Environment programme: Pacific Islands Regional Marine Species Programme 2008–2012. 48p. Apia, Samoa: SPREP.
- Secretariat of the Pacific Regional Environmental Programme (SPREP). 2009. *Guidelines for Invasive Species Management in the Pacific: A Pacific Strategy for Managing Pests, Weeds and Other Invasive Species*. Apia, Samoa: SPREP.
- Secretariat of the Pacific Regional Environmental Programme (SPREP). 2011. *Regional Wetlands Action Plan for the Pacific Islands 2011–2013*. Apia, Samoa: SPREP.
- Secretariat of the Pacific Regional Environmental Programme (SPREP). 2013a. *Pacific Environment Information Network (PEIN): Country Profiles- The Cook Islands*. Apia, Samoa: SPREP.
- Secretariat of the Pacific Regional Environmental Programme (SPREP). 2013b. *Pacific Islands Regional Marine Species Programme 2013–2017*. Apia, Samoa: SPREP.
- Siedel H. and Lal P.N. 2010. *Economic Value of the Pacific Ocean to the Pacific Island Countries and Territories*. IUCN Oceania, July 2010.
- Skelton P.A. and South G.R. 2006. Seagrasses from Fiji and Samoa. *New Zealand Journal of Marine and Freshwater Research* 40:345–356.
- South Pacific Whale Research Consortium (SPWRC). 2004. Report of the Fifth Annual meeting of the South Pacific Whale Research Consortium 2–6 April 2004, Byron Bay, NSW, Australia.
- Spalding M., Kainuma M. and Collins L. 2010a. *World Atlas of Mangroves*. Earthscan.
- Spalding M., Kainuma M. and Collins L. 2010b. *World Atlas of Mangroves*. Fiji. Okinawa: International Society for Mangrove Ecosystems. 162pp.
- Stattersfield A., Crosby M.J., Long A.J. and Wege D.C. 1998. *Endemic Bird Areas of the world: priorities for biodiversity conservation*. Cambridge, UK: BirdLife International.
- Sykes H.R. and Morris C. 2007. Status of Coral Reefs in the Fiji Islands, 2007. In: Whippy-Morris C (ed) *South-West Pacific, Status of Coral Reefs Report 2007*. p. 1 – 51. Institute of Marine Resources, University of the South Pacific.
- Thaman R.R., Balawa A. and Fong T. 2013. Putting Ancient Winds and Life into New Sails: Indigenous Knowledge as a Basis for Education for Sustainable Development (ESD) – A Case Study of the Return of Marine Biodiversity to Vanua Navakavu, Fiji. Proceedings of the Pacific Regional Symposium on “A Decade of Rethinking Pacific Education 2001–2011”. Atele, Tonga: Institute of Education, University of the South Pacific. 22pp (In press).
- Tuiwawa M.V., Tuiwawa S.H. and Skelton P.A. 2013. *A Field Guide to the Mangrove and Seagrass Species of Fiji*. University of the South Pacific.
- Wall J.R.D. and Hansell J.F.R. 1975. *Land Resources of the Solomon Islands*. Volume 4. New Georgia Group and the Russell Islands. Land Resources Study. Land Resources Division. Ministry of Overseas Development. AGRIS Report from FAO.



Wallace B.P., DiMatteo A.D., Boltzen A.B., Chaloupka M.Y., Hutchinson B.J., Abreu-Grobois F.A., Mortimer J.A., Seminoff J.A., Amorocho D., Bjørndal K.A., Bourjea J., Bowen B.W., Dueñas R.B., Casale P., Choudhury B.C., Costa A., Dutton P.H., Fallabrino A., Finkbeiner E.M., Girard A., Girondot M., Hamann M., Hurley B.J., López-Mendilaharsu M., Marcovaldi M.A., Musick J.A., Nel R., Pilcher N.J., Troëng S., Witherington B., and Mast R.B.. 2011. Global Conservation Priorities for Marine Turtles. PLoS ONE 6:e24510.

Watling D. 2013. Draft Mangrove Management Plan. Department of Environment. Fiji.

Waycot M., McKenzie L.J., Mellors J.E., Ellison J.C., Sheaves M.T., Collier C., Schwarz A.M., Webb A., Johnson J.E. and Payri C.E. 2011. Vulnerability of Mangroves, Seagrasses and Intertidal Flats in the Tropical Pacific to Climate Change. In: Bell J.D., Johnson J.E. and Hobday A.J. (Eds.). Vulnerability of Tropical Pacific Fisheries and Aquaculture to Climate Change. Noumea, New Caledonia: Secretariat of the Pacific Community.

Western and Central Pacific Fisheries Commission (WCPFC). 2013. Summary Report. Scientific Committee, Ninth Regular Session, Western and Central Pacific Fisheries Commission, Pohnpei.

Wilkinson C. 2008. Status of Coral Reefs of the World. Global Coral Reef Monitoring Network and Reef and Rainforest Research Centre, Townsville, Australia. Global Coral Reef Monitoring Network.

World Database on Protected Areas (WDPA). 2013. Protected Planet.

# Appendix A:

Ratification of International Conventions and related regional and national frameworks, policies and legislation in Fiji

(Next page)



| International/Multilateral Environment Agreement/Convention   | Protocol  | Regional Agreement   | National Policy   | National Strategy and/or Action Plan | National Legislation   | Subsidiary Legislation   |
|---|---|--|---|--------------------------------------|--|--|
| CBD<br>Signed 09.10.1992; Ratified 25.02.1993   | Nagoya Protocol<br>Acceded 24.10.2012<br>Cartagena Protocol<br>Signed 02.05.2001<br>Ratified 05.06.2001 | Apia Convention, SP Forum Fisheries Convention, Driftnet Convention, Noumea Convention, Niue Convention, Wellington Convention   | FNCCCP, 10 Yr Moratorium, REDD+, Rural Land Use Policy, MESCAL, National Energy Policy, POWPA<br>ICM, Pacific Invasives Initiative, Fiji Harvesting Code Of Practice<br>Fiji Tourist Development Plan 2007 - 2016 | NBSAP 2003                           | No specific legislation.<br>Related legislations: EMA 2005 Forest Decree, National Trust Act, Land Conservation and Improvement Act, Endangered and Protected Species Act 2002, Fisheries Act, Offshore Fisheries Management Decree 2012 | EM (EIA Process) Regs<br>Itaukei Land Forest Regs<br>Endangered and Protected Species Regs, Moratorium Regs, Fisheries (RUBA) Regs, Fisheries Regs, Itaukei Land Forest Regs, EM/Waste Disposaland Recycling) Regs.                |
| Ramsar<br>Contracting Party<br>Entry into force 11.08.06  |   | Noumea Convention, Apia Convention, Niue Convention, SP Forum Convention, Fisheries Convention, Wellington Convention, Driftnet Convention                                     | FNCCCP, Pacific Invasive Initiative, Land Use Policy, MESCAL, Fiji Harvesting Code of Practice, ICM, POWPA, 10 Yr Moratorium Species Program  | NBSAP 2003                           | No specific legislation.<br>Related legislations: EMA  |  |
| World Heritage Convention<br>Ratified 21.11.1990  |   | Apia Convention, Noumea Convention   | Redd+ policy, ICM, MESCAL, POWPA, Species Program, 10 Yr Moratorium   | NBSAP 2003                           | Fiji World Heritage Decree 2013  |  |
| CITES<br>Acceded 30.09.1997; Entry into force 29.12.1997  |   | Pacific Islands Cetaceans MOU, SP Forum Fisheries Convention, Wellington Convention, Driftnet Convention, Apia Convention, Noumea Convention                                   | 10 Yr Moratorium, POWPA, ICM, Species Program, MESCAL   | NBSAP 2003                           | Legislations specific to CITES are the Endangered and Protected Species Act and the Endangered and Protected Species Regulations   | Endangered and Protected Species Regs, Fisheries Moratorium Fisheries (RUBA) Regs, Fisheries Regs, Land Forest Regs  |
| CMS<br>Entry into force 01.04.2013; MOU Signatory Pacific Island Cetaceans  |   | Pacific Islands Cetaceans MOU, SP Forum Fisheries Convention, Wellington Convention, Driftnet Convention, Apia Convention, Noumea Convention, Niue Cnv, Fish Stocks Convention | Species Program, POWPA, 10 Yr Moratorium, MESCAL, ICM, REDD+ Policy   | NBSAP 2003                           | No specific legislation<br>Related legislations: EMA, Offshore Fisheries Management Decree, Fisheries Act, Itaukei Affairs Act, Endangered and Protection Species Act Marine Spaces Act.   | EM (EIA Process) Regs, EM Waste Disposal and Recycling) Regs, Endangered and Protected Species Regs, Fisheries Moratorium, Fisheries (RUBA) Regs, Fisheries Regs   |
| UNFCCC<br>Signed 09.10.1992; Ratified 25.02.1993  | Kyoto Protocol<br>Signed 17.09.1998;<br>Ratified 17.09.1998   | Apia Convention, Noumea Convention   | FNCCP, REDD+ Policy, Fiji Harvesting Code of Practice, POWPA, Rural land use Policy, MESCAL   | NBSAP 2003                           | No specific legislation<br>Related legislations: EMA, Forest Decree, Ozone Depleting Substances Act 1998, Crown Lands Act, Land Conservation and Improvement Act, Itaukei Lands Act, Forest Decree                                       | EM (EIA Process) Regs, EM Waste Disposal and Recycling) Regs, Itaukei Land Forest Regs, Endangered and Protected Species Regs, Itaukei Land Forest Regs Fisheries Moratorium Fisheries (RUBA) Regs Ozone Depleting Substances Regs |
| UNCCD<br>Acceded 26.08.1998   |   | Apia Convention, Noumea Convention, SP Forum Convention  | FNCCP, REDD+ Policy, Rural Land Policy, Fiji Harvesting Code Policy, POWPA, ICM, MESCAL   | NBSAP 2003                           | No specific legislation<br>Related legislations: EMA, Forest Decree, Agricultural Landlord and Tenant Act, Land Conservation and Improvement Act, Crown Lands Act, Itaukei Lands Trust Act   | EM (EIA Process) Regs, Endangered and Protected Species Regs<br>Itaukei Land Forest Regs<br>Ozone Depleting Substances Regs 2000, Itaukei Land Forest Regulations  |
| UNCLOS<br>Signed 10.12.1982; Ratified 10.12.1982<br>Provision relating to the conservation and management of straddling fish stocks and highly migratory fish stocks - 12.12.1996 |   |  |   |                                      | Marine Spaces Act 1977, Continental Shelf Act, Fisheries Act, Offshore Fisheries Management Decree, International Seabed Mineral Management Decree 2013  |  |

# Appendix B:

## National Governance – Governance of terrestrial and marine ecosystems

| Institutional Arrangement   | Framework that sets up the Institutional Arrangement                   | Function of the Institutional Arrangement and Status  |
|---|--|---|
| National Environmental Council (NEC)                                    | Section 7(1) of the EMA 2005   | To approve the National Report and NES, oversee the implementation of the NSER, facilitate a forum for discussion on environmental issues, make resolutions on environment efforts, ensure the implementation of commitments under regional and international treaties and advise government of the same and perform any other functions under the Act or any written law. The Council meets four times a year as required under the EMA. Although members of the council are made up of the PS for relevant Ministries, they are not always present, alternatively sending representatives to the meeting. |
| Coastal Zone Management Committee [CZMC]                                | Section 8(3) of the EMA 2005   | To prepare the coastal zone management plan.  |
| Environmental Tribunal  | Section 56(1) of the EMA 2005  | To hear and determine any appeal referred to it under this Act or any other written law. The Rules of the Tribunal were recently regulated under the Environment Management (Tribunal) Rules 2013.  |
| Public Participation under the Environment Impact Assessment Procedures | Sections EMA S 34(1), S 19(4), S 23(4) and S30 of the EIA Regulations  | The EIA Process as regulated under the EMA ensures the participation of the public in the decision making of developments that requires an EIA to be undertaken. There are several instances within the process in which the public is required to be informed about the project and be given the chance to review the EIA Report and comment on it.  |
| Conservation Committees   | Section 6 (1) of the Land Conservation and Improvement Act.            | To advise the Board on matters relating to the conservation of land and water resources in the area for which the Committee is appointed.   |
| National Trust  | Section 4 of the National Trust Act                                    | To promote the permanent preservation for the benefit of the nation of lands (including reefs) having national, historic, architectural or natural interest or beauty.  |
| National Trust Council  | Section 4 of the National Trust Act                                    | To make rules to regulate its own procedure, exercise powers of borrowing on mortgage which are conferred on the Trust by the Act, and to make bylaws for the purposes of carrying out functions of the Trust, including the regulation and protection of, the prevention of nuisances and the preservation of order upon any lands or other property of the Trust.   |
| Mangrove Management Committee   | Section 8(2) of the EMA 2005   | To advise the National Council on matters affecting environmental protection and resource management.   |
| Fiji Islands CITES Management Authority                                 | Section 4 of the Endangered And Protected Species Act 2002             | To advise government on CITES obligations and liaise with the CITES Secretariat on matters relating to CITES in Fiji.   |
| CITES Scientific Council  | Section 7(1) of the Endangered and Protected Species Act               | To advise the Authority on any matter relating to the CITES, monitor export permits granted for specimens listed in Appendix II and the actual export of the specimens, advise the Management Authority on any measures to be taken to limit the issue of export permits when the population status of a species so requires and to conduct research on any other species that are or likely to be endangered, threatened or exploited in the Fiji Islands.   |
| REDD+ Steering Committee.   | Section 8(2) of the EMA 2005   | To coordinate and facilitate the implementation of the Fiji REDD+ programme.  |
| EIA Unit  | Section 12(1) of the EMA 2005  | To examine and process development proposals and implement the EIA Process regulated under the Environment Management Act.  |
| Fiji International Seabed Authority (FISA)                              | S6 of the International Seabed Mineral Management Decree 2013 (ISMMMD) | To monitor and to undertake any advisory, supervisory and enforcement activities in relation to seabed mineral activities or protection of the marine environment (g) ensure activities are in a manner consistent with ISA rules and Fiji's responsibilities to UNCLOS.  |

# Appendix C:

## Legislation addressing key threats to habitats in Fiji

| Threats                        | Legal Framework  | Institutional Arrangements,   | Strategy/Plans/Comments   |
|--------------------------------|--|---|---|
| Land-use planning              | The legislation specific to Land-use Planning is the Town and Planning Act, and Land Use Decree.   | <p>The Department of Town and Country Planning under the Ministry of Urban Planning is the government department that enforces the Town and Planning Act. The Act establishes the legal framework that governs commercial and residential land use in Fiji. Local city and town councils, rural local authority and the Department of Environment work together to enforce the Act, General Order and policies relating to commercial and residential land use.</p> <p>Approval Assessment by Central board of Health in areas where Water Authority of Fiji services are not available, Zoning, Rezoning and Development Applications done facilitated by the Dept. of Town and Country Planning. Building Permit approvals.</p> | The Town Planning Act General Order applies in all areas to large-lot subdivision in which all lots are more than 2 acres in size.  |
| Environment impact assessment  | Legislation specific to Environment Impact Assessment is the Environment Management Act, and the EM (EIA Process) Regulations  | <p>Dept. of Environment is responsible for regulating the Environment Management Act including the overseeing of the EIA process for any development proposals.</p> <p>DOE discharges result of EIA after assessment by approving authority.</p> <p>EIA reports are prepared by an accredited consultant at the proponent's [applicant's] cost.</p>   | <p>EIA Consultant chosen from the list of registered consultants published by DoE.</p> <p>EIA guideline was formalised and published by the Department of Environment in 2008 primarily for approving authorities and the environment management units, with the aim of helping planning staff involved in the processing of development proposals and projects.</p> <p>It also allows public participation and a means to voice concerns and shape mitigating factors towards proposed or likely environmental consequences.</p>             |
| Pollution and waste management | Legislation specific to pollution and waste management are the Environment Management Act and the Environment Management (Waste Disposal and Recycling) Regulations 2007 and the Litter Decree | The Department of Environment is mandated to regulate waste disposal and management in Fiji. It issues permits through the Waste and Pollution Control Administrator for discharge, handling, storage or production of pollutants, waste or hazardous substances into the environment.  | <p>Fiji National Solid Waste Management Strategy, Fiji National Liquid Waste Management Strategy and Action Plan, AFD regional solid Waste management Initiative.</p> <p>The National Solid Waste Management Strategy established by the government runs parallel with the Regional Solid Waste Management Strategy finalised by SPREP. The Waste Management Project funded by JICA is another example of the great efforts put in by IGOs and NGOs in assisting the Fiji government deal with its pollution and waste-management issues.</p> |

continued



| Threats                             | Legal Framework  | Institutional Arrangements,   | Strategy/Plans/Comments  |
|-------------------------------------|--|---|--|
| Deforestation and mining            | Legislation specific to Deforestation And Mining are the Forest Decree, iTaukei Land (Forest) Regulations [Cap 134], Mining Act, International Seabed Mineral Management Decree 2013 | The Director of Mines of the Mineral Resources Department issues Prospector's Right, Prospecting Licenses, Special Prospecting License, Permit to Mine, Mining Lease, Special Mining Lease, Special Site Right and Road Access License.<br><br>Itaukei Land trust Board acts on behalf and consent of land owning units for any planned mining or logging developments on such lands. Issuance of a Timber license is subject to the approval by the licensing officer of a logging plan prepared by the applicant. | MESCAL, POWPA. Fiji Sustainable Economic and Empowerment Development Strategy (SEEDS), REDD+<br><br>Fiji's REDD+ Policy stands alongside its UNFCCC obligations and the forefront of Fiji's aims to reduce such emissions that affect climate change. Issuance of a Timber license are subject to the approval by the licensing officer of a logging plan prepared by the applicant, The Fiji Code of Harvesting Practice remains the guiding principle of all forest-harvesting operations prescribing practices aimed at protecting the forest environment, its assets and its users within economically viable operations and environmentally friendly standards. |
| Climate change and disaster impacts | Natural Disaster Management Act  | Emergency Planning and Coordination Unit of the National Disaster Management Office activates the following actions upon the occurrence of a disaster:<br><br>emergency planning;<br>emergency operations;<br>emergency coordination; and<br>National Emergency Centre.   | Fiji National Climate Change Policy, REDD+ Policy, Disaster Risk Reduction and Disaster Management: A Framework for Action 2005–2015, Disaster Risk Management Strategy, Regional Islands Framework for Disaster Risk Reduction and Disaster Management 2005–2015, Coping with Climate Change in the Pacific Island Region (CCCPIR), Roadmap for Democratic, Sustainable, Socio Economic Development 2009–2014, Pacific Island Framework for Action on Climate Change 2006–2015 (PIFACC), Clean Development Mechanism (CDM) Policy, MESCAL, Green Growth Initiative, Pacific Mangroves Initiative.   |



# Appendix D:

## Non-governmental conservation initiatives in Fiji

| Multi Environmental Agreement | Initiative name                   | Type (for example, NGO project, inter-governmental regional initiative, etc.) | Brief description (purpose, achievements, etc.)  | Comments/Status   |
|-------------------------------|-----------------------------------|---|--|---|
| CBD, Ramsar                   | Coral Triangle Pacific            | IUCN, ADB   | CTI Launched in 2009; Fiji joined the initiative (Phase 2) in 2011. To improve the resilience of their coastal and marine ecosystems and climate change  | Began in 2011 and ends in 2014                              |
| CBD/Ramsar                    | MESCAL                            | IUCN  | Launched in December 2009 to increase the climate-change resilience of Pacific Islanders as well as improve their livelihoods through selected capacity support in adaptive co-management and restoration of mangroves and associated ecosystems   | Began in 2010 and scheduled to end in December 2013         |
| CBD, CITES, Ramsar            | FLMMA                             | WWF, WCS, Govt, PCDF, National Trust, USP                                     | Formed in 2001 and officially registered as an organisation in 2004. To advocate active community participation in developing, implementing and evaluating their marine area management plan(s) through adaptive management approaches   | Long-term and indefinite commitment                         |
| CBD, CITES                    | CBNRM                             | WCS, WWF  | Date of initiative launch not provided but has traditionally been practiced by Fijian traditional societies for centuries (Veitayaki 2000). It is an approach for conservation and development that recognises the rights of local people to manage and benefit from the management and use of natural resources | On-going and long-term                                      |
| CBD                           | American Iguana Bounty Initiative | Nature Fiji and Govt.   | Launched in June 2013 to offer initiatives and involve communities in capturing live iguanas and their eggs and/or killing American iguanas in attempting to eradicate them  | Strengthened application in 2013 and gaining momentum       |
| CBD, UNCLOS, Ramsar           | Coral Triangle Initiative         | WWF   | Commenced in the late 1990s to safeguard the health of the region's valuable resources by building a sustainable live reef fish trade, promoting sustainable tuna fisheries, protecting marine turtles, etc.   | On-going  |
| CBD, CITES                    | Endangered species Program        | Nature Fiji   | Date of initiative launch not provided, but this is an initiative to work on the protection of Fiji's endangered species of biodiversity of cultural importance using a recovery plan and funding  | Long-term commitment  |
| CBD/UNCLOS                    | Battling Invasive Species (PIP)   | IUCN, SPREP   | Date of initiative commencement in Fiji not provided but it is an initiative to support Pacific Invasives Partnership (PIP) in strengthening the capacity of Biosecurity Departments in controlling the introduction of potentially harmful species  | On-going by collective NGOs across the Pacific              |
| CBD, WHC, Ramsar              | MACBIO                            | IUCN, SPREP   | Launched in 2013 to strengthen management capacity of MPAs and facilitates economic evaluations of coastal and marine resources  | Launched in 2013 geared toward strengthening MPA management |
| CBD/UNFCCC, Ramsar            | Pacific Mangroves Initiative      | IUCN, SPREP, UNDP   | Commenced in 2009 to promote sustainable management of mangroves and associated coastal ecosystems   | Now in form of MESCAL, which ends in December 2013          |

continued

| Multi Environmental Agreement | Initiative name   | Type (for example, NGO project, inter-governmental regional initiative, etc.) | Brief description (purpose, achievements, etc.)  | Comments/Status                                |
|-------------------------------|---|---|--|--|
| CBD, CITES, WHC, Ramsar       | BIOPAMA   | IUCN  | Launched in July 2011 to improve management capacity for effective protected areas management  | On-going                                       |
| CBD, WHC                      | Sigatoka Sand dunes, YaduaTaba Crested Iguana Sanctuary et al | Government, National Trust  | The Sigatoka Sand dune was established in 1989; YaduaTaba Crested Iguana Sanctuary established in 1980; Garrick Forest Reserve established in 1980. To consolidate the conservation, protection, sustainable management of Fiji's natural and cultural heritage for the benefit and enjoyment of the peoples of Fiji | On-going and indefinite                        |
| CBD, UNFCCC                   | Pacific adaptation to Climate Change Project (PACC)           | SPREP, Government   | Launched in 2009 to improve capacity of Pacific island countries to mainstream climate change adaptation into government policies and plans, develop systematic guidelines for adaptation  | Began in 2009, on-going                        |
| CBD, UNFCCC                   | Pacific islands framework for action on climate change        | Intergovernmental Regional initiative   | Launched in 2006 to strengthen climate change (CC) action and awareness in the region, provide guidance on design and implementation of CC measures, development of national and regional sustainable development strategies, sector policies, CC-specific policies  | Commenced in 2006 and scheduled to end in 2016 |

# Appendix E:

## Legislation in Fiji relating to species conservation – legal frameworks, institutional arrangements and strategies in place related to species conservation

| Threats            | Legal Framework  | Institutional Arrangements  | Strategy/Plans/Comments   |
|--------------------|--|---|---|
| Endangered species | Legislation specific to Endangered species are the Endangered and Protected Species Act and Endangered and Protected Species Regulations | <p>Fiji Islands CITES Management Authority issues export, import, re-export permits of species when all requirements have been met by the proponent</p> <p>The CITES Scientific Council conducts research on any other species that are or likely to be endangered, threatened or exploited in Fiji and advises the Authority on any matter relating to the CITES, including whether or not the proposed export of any specimen will be detrimental to the survival of the species involved</p> | <p>Marine Turtle Action Plan, Endangered Species Program, Fiji Petrel Project, Turtle Conservation Project, 10 Yr Moratorium, ICM, EBM, CBRM, FLMMMA</p> <p>There have been slight improvements but an overall lack of Government commitment to budgetary commitments, enforcement, manpower and resources application. This is further undermined by policy fragmentation, unclear ministerial roles and responsibilities, including a blatant disregard of national resource protection laws and policies by the general population, which collectively has been a substantial detrimental factor in the conservation and protection of these endangered species</p> <p>Excessive extraction stemming from the lure of economic returns fuel threats of illegal fishing and killing of these endangered species</p> |
| Invasive species   | Legislation specific to Invasive Species is the Biosecurity Promulgation 2008  | The Biosecurity Authority may devise a Biosecurity Emergency Response Plan to deal with an incursion of a regulated pest or disease in Fiji. The Authority also advises Government on matters relating to animal and plant quarantine and biosecurity and liaises with appropriate Ministries and statutory bodies on such matters  | <p>American Iguana Bounty Initiative, Species Program, Pacific Invasive Species Initiative. Fiji faces potentially damaging threats to its biodiversity and food security from the present threats presented by existing invasive species</p> <p>The latest invasive species, the American Iguana, exemplifies the threats caused invasive species, by feeding on plants and crops including dalo leaves, cassava tops, bele, tomatoes, cabbage, beans and yam vines, as well as endemic plants, bird eggs and nestlings. The Government is already financially burdened in dealing with the other invasive species, like termites, fruit flies, etc., and now has to deal with this latest threat</p>  |

continued



| Threats           | Legal Framework  | Institutional Arrangements  | Strategy/Plans/Comments   |
|-------------------|--|---|---|
| Genetic resources | There is no legislation specifically relating to genetic resources | <p>There is at present an absence of policy, strategies and laws that offer adequate protection for Fiji's resources. Throughout the years, resources have been removed, developed into commercial products and then sold, and the benefits have not been received by the owners of the resources</p> <p>Some resources are patented or trade marked by companies or entities in other countries, excluding the countries from which they are extracted from any recognition or benefit</p> <p>Important plant/marine species are being removed from the ground or sea without proper documentation, with benefits completely by-passing local resource owners. List of vulnerable elements to biosafety threats in Fiji include the human populace, flora and fauna, surrounding marine ecosystems, food security and air, soil and water health and quality</p> | <p>International Network of Edible Aroids (INEA) Project, Pacific Agricultural Genetic Resources Action Plan (PAPGREN), Dasheen Project, Global Crop Diversity Trust Project, PACINET (the Pacific Islands Network for Taxonomy)<sup>1</sup></p> <p>Fiji's rich biodiversity has a high number of endemic species used in the cosmetic, pharmaceutical, agriculture and biotechnology fields. Adequate policy and national legislation will provide Fiji with more authority and control over the accessing of genetic resources, legally. Currently, important plant and marine species are being removed from the ground or sea without proper documentation, and the benefits are completely by-passing local resource owners due to the absence of an ABS policy and laxity of laws.</p> <p>Action to address genetic resources will provide protection, preservation and a medium for resource, crop and food security</p> |
| Biosafety         | There is no legislation specifically relating to biosafety         | <p>Apart from ratification of the related Conventions and the Cartagena protocol, Fiji had drafted National Biosafety Framework in 2007 and established Biosafety Clearing House in 2012. Fiji, however, has yet to fully fulfil its obligations pertaining to its international obligations concerning biosafety</p> <p>The lack of clear strategies by Government is further aided by the weak incorporation of biosafety in relevant national legislation. This is mainly due to the fact that the biotechnology/genetic field has not been well understood by, or accessible to, the non-geneticists science personnel in Fiji working in the fields of conservation science and law in Fiji and other developing Pacific island states</p>   | <p>Food Animal Biosecurity Network (FABN) project, Pacific Invasives Initiative, American Iguana Bounty Initiative, National Biosafety Framework (2007)</p> <p>One of the key issues is also how best to maximise the benefits of biotechnology in sustainable development in the region</p> <p>Problems arise from the fact that the biotechnology/genetic field is not well understood by, or accessible to, the non-geneticist personnel in Fiji working in the fields of conservation science and law in developing Pacific island states. Genetic modification involves isolating single genes from micro-organisms, plants or animals and inserting them into the genetic material of the cells of another, clearly an area in which Fiji lacks expertise, resources and equipment let alone knowledge to effectively implement protective management policies and action plans</p>                                       |

1 South Pacific commission Land Resources Division; The Centre for Pacific Crops and Trees (CePaCT) webpage [http://www.spc.int/lrd/index.php?option=com\\_content&view=article&id=649&Itemid=107](http://www.spc.int/lrd/index.php?option=com_content&view=article&id=649&Itemid=107) (date accessed: 24 September, 2013)





