



NATIONAL MARINE ECOSYSTEM SERVICE VALUATION

SUMMARY REPORT

VANUATU





MARINE ECOSYSTEM SERVICE VALUATION



The living resources of the Pacific Ocean are part of the region's rich natural capital. Marine and coastal ecosystems provide benefits for all people in and beyond the region. These benefits are called ecosystem services and include a broad range of values linking the environment with development and human well-being.

Yet, the natural capital of the ocean often remains invisible. Truly recognizing the value of such resources can help to highlight their importance and prevent their unnecessary loss. The MACBIO project provides technical support to the governments of Fiji, Kiribati, Solomon Islands, Tonga and Vanuatu in identifying and highlighting the values of marine and coastal resources and their ecosystem services. Once values are more visible, governments and stakeholders can plan and manage resources more sustainably, and maintain economic and social benefits of marine and coastal biodiversity in the medium and long term.

The MACBIO Project has undertaken economic assessments of Vanuatu's marine and coastal ecosystem services, and supports the integration of results into national policies and development planning. For a copy of all report and communication material please visit www.macbio.pacific.info.

MARINE ECOSYSTEM
SERVICE VALUATION

MARINE SPATIAL PLANNING

EFFECTIVE MANAGEMENT



macbio.pacific.info



NATIONAL MARINE ECOSYSTEM SERVICE VALUATION

SUMMARY REPORT

VANUATU

PRINCIPAL AUTHORS: Nicolas Pascal¹, Guillaume Leport², Vatu Molisa³

CONTRIBUTING AUTHOR: Hans Wendt⁴

EDITORS: Luke Brander⁵, Leanne Fernandes⁴, Jacob Salcone⁴, Andrew Seidl⁶



Marine and Coastal Biodiversity Management
in Pacific Island Countries



On behalf of:



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

of the Federal Republic of Germany

AUTHOR AFFILIATIONS

1 Blue Finance, Washington DC, USA; Emua, Vanuatu

2 Centre de Recherches Insulaires et Observatoire de l'Environnement (CRIOBE), Scientific Research Unit, Centre National de la Recherche Scientifique (CNRS) – Ecole Pratique des Hautes Etudes (EPHE), Papetoai, Moorea, French Polynesia

3 Department of Environmental Protection and Conservation, Port Vila, Vanuatu

4 IUCN Oceania Regional Office, Suva, Fiji

5 Brander Environmental Economics, Hong Kong

6 Colorado State University – Dept. of Agricultural and Resource Economics Ft. Collins, Colorado, USA

7 Centre de Recherches Insulaires et Observatoire de l'Environnement (CRIOBE), Scientific Research Unit, Centre National de la Recherche Scientifique (CNRS) – Ecole Pratique des Hautes Etudes (EPHE), Papetoai, Moorea, French Polynesia



© MACBIO 2015

All MACBIO Project partners including the Secretariat of the Pacific Regional Environment Programme (SPREP), the International Union for Conservation of Nature (IUCN) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) are the inherent copyright owners of this publication.

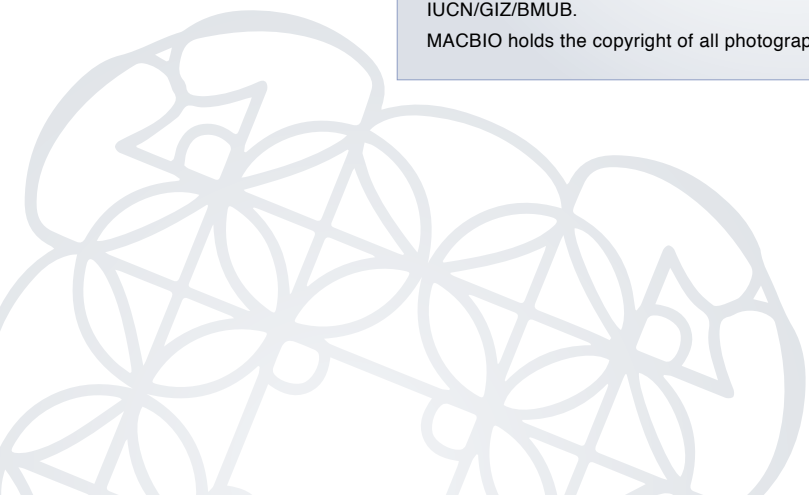
Reproduction of this publication for educational or other non-commercial uses is authorized without prior written permission from the copyright holder(s) provided the source is fully acknowledged.

Reproduction of this publication for resale or other commercial purposes is prohibited without prior written permission of the copyright holder(s). The designation of geographical entities in this publication, and the presentation of the material do not imply the expression of any opinion whatsoever on the part of SPREP, IUCN, GIZ or the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) concerning the legal status of any country, territory, or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

This document has been produced with funds provided by the International Climate Initiative (IKI). BMUB supports this initiative on the basis of a decision adopted by the German Bundestag. The views expressed herein should not be taken, in any way, to reflect the official opinion of the Federal Government of Germany.

The views expressed in this publication do not necessarily reflect those of SPREP/ IUCN/GIZ/BMUB.

MACBIO holds the copyright of all photographs, unless otherwise indicated.



This study, conducted in 2015, aimed to determine the economic value of seven marine and coastal ecosystem services in Vanuatu. The study forms part of the broader MACBIO project (Marine and Coastal Biodiversity Management in Pacific Island Countries) that aims to strengthen the management of marine and coastal biodiversity in Pacific island countries.

The role that natural ecosystems, especially marine ecosystems, play in human wellbeing is often overlooked or taken for granted. The benefits humans receive from ecosystems, called *ecosystem services*, are often hidden because markets do not directly reveal their value — nature provides these benefits for free. Failure to recognise the role that marine ecosystems play in supporting livelihoods, economic activity, and human wellbeing has, in many instances, led to inequitable and unsustainable resource management decisions.

Coastal and marine resources provide Ni-Vanuatu businesses, households, and government many real and measurable benefits. The exclusive economic zone of Vanuatu, nearly 700,000 square kilometers of ocean, is more than 50 times larger than the country's land area. This report describes, quantifies and, where sufficient data is available, estimates the economic value of many of Vanuatu's marine and coastal ecosystem services, in an effort to inform sustainable and equitable management decisions and support national marine spatial planning.

Seven key marine ecosystem services were evaluated in detail: subsistence fishing; commercial fishing; minerals and mining; tourism; coastal protection; carbon sequestration; and marine research and management. Other services are explored as well, including cultural and traditional values associated with the sea, potential future industries and other human benefits that have not yet been developed or analyzed. A scarcity of data about many of these ecosystem services prevents calculation of the *total* economic value, so the values below should be regarded as minimum estimates. Data gaps are described in detail in the full report.

SMALL-SCALE FISHERIES

Small-scale inshore fishing and gleaning for home consumption and sale at local markets provides food security and incomes for many Ni-Vanuatu households. The subsistence and inshore commercial fisheries depend on the health and productivity of reef, lagoon, and mangrove areas.

SUBSISTENCE FISHING

The economic value of Vanuatu's inshore subsistence fisheries is about VT 519.76-635.46 million per year. This value accrues to an estimated 15,500 households. Over-harvesting of crabs and reef fish in more heavily populated areas could threaten the sustainability of this ecosystem service.

SMALL-SCALE COMMERCIAL FISHERIES

Small-scale commercial fisheries in Vanuatu include reef fish, crabs and lobsters, deep-slope demersal fish, *bêche-de-mer*, trochus, and the aquarium trade. Reef fish, crabs and lobsters, and deep-slope fish (mostly snapper) are sold locally; *bêche-de-mer*, trochus, and aquarium products are harvested for export. More than 10% of households (5,200 households) in Vanuatu receive some income from small-scale fishing. The domestic reef, invertebrate and deep-slope fisheries provide net benefits of about VT 294 million annually. The export fisheries provide about VT 26.8 million in net annual benefits.

All of these sectors provide income to small-scale fishers in rural and urban Vanuatu, although most of the value of trochus, aquarium products and *bêche-de-mer* accrues to foreign exporters. Costs are high for aquarium trade and *bêche-de-mer* sectors so net benefits are lower. Management plans for *bêche-de-mer* and trochus have been improved over the past 20 years; if enforced, these plans should enable sustainability. Not much is known about the sustainability of the aquarium trade.

OFFSHORE COMMERCIAL TUNA FISHERY

All large-scale commercial tuna fishing in Vanuatu waters is conducted by foreign fishing vessels, mostly from China, Fiji, and Taiwan. Albacore is the dominant commercial tuna species caught in Vanuatu, making up more than 50% of the annual catch, followed by yellowtail, skipjack, and bigeye. Scientists report that yellowfin stocks show signs of overfishing and bigeye stocks are becoming dangerously small (both are caught within Vanuatu albeit in lower numbers than albacore); advice is that albacore and skipjack stocks remain healthy. Albacore fishing, mostly done by longline method, is likely to remain sustainable as long as costs-to-returns ratios remain high enough to limit fishing effort; subsidized foreign fishing fleets could threaten this. Although the longline method is relatively sustainable for albacore fishing, bycatch of sharks and other pelagic species such as moonfish and marlin is substantial.

The average gross value of the tuna catch in 2013 was US\$ 27million (VT 2.5 billion). Since catches are off-loaded in processing facilities in regional island countries or trans-shipped to distant markets the positive economic impact of the industry for Vanuatu is mainly from licensing of foreign fishing vessels. Government revenues of at least US\$ 1.36 million per year (VT 121 million) are generated from license fees. In addition, Vanuatu receives payments from the Government of the USA and the USA tuna industry for fishing access given to US purse seiners. These payments come under the terms of the US multilateral tuna treaty and represented a value of approximately US\$ 250,000 in 2006.

Most of the economic benefits go to foreign fishing fleets, although the industry provides some employment on fishing vessels (about 175 persons). The net benefits to fishing fleets are a fraction of the gross value due to high costs of the longline fishing method. No Ni-Vanuatu boats, canneries or sophisticated processing facilities exist in Vanuatu, so Vanuatu does not capture much of the value-added benefit. One sushi export company (Japanese) is currently operating, but the economic benefits could not be estimated due to insufficient data.

RECREATIONAL GAME FISHERY

Blue marlin and other game fish attract recreational sport fishers to Vanuatu. Recreational fishing guides and charter companies are based mainly in Efate and Santo. Companies reported about 13,000 passengers in 2012, catching an estimated 70 tonnes of game fish. The net revenue received by fishing companies was about VT 129 million; the representative market value of fish caught is approximately VT 13.4 million. The sustainability of this industry is unknown and warrants additional study.

AGGREGATE AND DEEP-SEA MINING

Some extraction of coastal aggregate (sand, gravel, rock and shell) is observed close to Port Vila. The principal users are government and the private sector for construction, road building, making cement blocks and for seawall construction. The household sector also uses a significant amount of sand and gravel for landscaping. Volumes of approximately 15,000 m³ were authorized for extraction in 2013 producing revenue of VT 320,000 for the government from fees. The net producer benefit of sand mining in 2013 is approximately VT 15.1 million. The negative impacts of dredging and beach mining could not be assessed by this research. Probable impacts include beach erosion and destruction and siltation of reef and lagoon habitat, which may harm Vanuatu's largest marine ecosystem services: inshore fisheries and tourism. The impacts of beach mining and lagoon dredging to inshore fisheries and tourism are potentially significant and warrant further assessment.

Exploration for deep-sea mining opportunities is already providing benefits to Vanuatu government from various fees. Currently 102 prospecting licences are active and 44 prospecting licences are pending renewal from two prospecting companies. Because these licenses are confidential, the economic benefits could not be quantified. Any benefits to Ni-Vanuatu households or the general economy will depend upon royalty agreements and benefit sharing legislated by the Vanuatu Deep Sea Minerals Policy, in draft at time of writing. The magnitude of threats to offshore fishing and dive tourism cannot yet be quantified, but must be considered. Tourism and tuna industries provide substantial sustainable benefits to Vanuatu and may be impacted by deep-sea mining.

TOURISM

Healthy marine and coastal ecosystems support a lucrative tourism industry that includes diving, fishing, and other water sports. Marine and coastal ecosystems contribute VT 613–1,095 million from tourism in net economic benefit to Vanuatu each year. The majority of these benefits are from dive and snorkel tourism. In magnitude, the net benefits from tourism are second only to coastal protection (below). Tourism benefits a variety of businesses and their employees and provides government tax revenue. Tourism can be a sustainable ecosystem service if managed and regulated. Mining and fishing, particularly destructive types of inshore fishing, could negatively impact tourism benefits.

COASTAL PROTECTION

Fringing reefs, mangroves and seagrasses protect Vanuatu's coasts from erosion and flooding. The *avoided costs* method is used to analyze their value. Because many of the commercial and residential properties in Vanuatu are near the coast, protection from flood and erosion damage from healthy coral reefs could be quite significant, worth from VT 1.2 to 2 million annually.

CARBON SEQUESTRATION

Vanuatu's mangroves and seagrasses also provide carbon sequestration benefits to the world, worth up to VT 760 million per year. If protected, areas of mangroves and seagrass at risk for destruction could be marketed and sold as carbon offsets, but the market price might be low and the costs of verifying and managing the protected areas would need to be assessed on a case-by-case basis.

RESEARCH, MANAGEMENT, AND EDUCATION

Marine and coastal areas attract foreign aid and research funding that benefits Vanuatu. In 2013, Vanuatu received VT 434 million (US\$ 4.9 million) in project funding related to marine and coastal ecosystems. Investment in marine and coastal biodiversity includes many projects run through the Fisheries and Environment departments. Money spent by individuals and institutions that research marine and coastal ecosystems, or advocate for their protection, benefits government mostly, although aid expenditures indirectly benefit local institutions, local communities and the private sector (experts and implementing agencies). Marine research and protection projects also bring technical assistance and capacity development, and potentially increase the value of ecosystem services through improved resource management and sustainability.

Other marine and coastal ecosystem services include cultural identity, handicrafts, bioremediation and aesthetic beauty. These services have not been quantified by this study because of a lack of data, but they indeed provide benefits to Vanuatu citizens and the rest of the world.



CONCLUSIONS

The total value of marine and coastal ecosystem services assessed in Vanuatu is estimated to range from VT 3,325 to VT 5,715 million per year (US\$ 37.4 to US\$ 64.2 million). The majority of Vanuatu's marine ecosystem service benefits come from subsistence and small-scale commercial fishing, tourism, and protection from erosion and flooding (avoided costs). The value of coastal protection accrues to owners of coastal businesses; carbon sequestration provides global benefits, albeit with no related economic activity within Vanuatu.

MACBIO's formal link with the Vanuatu government is through the Department of Environment, but from the onset the project has made an effort to support and assist all departments relevant to marine and coastal resource use and management. The Fisheries Division, in particular, is responsible for oversight of many key marine ecosystem services, and was instrumental in deriving the values above. Throughout this research, the authors endeavored to share information about the economic value of marine ecosystems with all the Departments that have a role in marine resource use and management. These discussions indicated an awareness and understanding that economic valuation information can inform development policy, legislation, and regulation of marine activities.

This study is a step towards a national process of recognising the human benefits of natural ecosystems, which will lead to more equitable and sustainable management of Vanuatu's marine assets. These results can serve as an inventory of current information about the economic value of Vanuatu's marine and coastal assets and as a starting point for more in-depth valuations of each of the ecosystem services discussed above. More generally, Vanuatu should consider making steps towards accounting for natural capital in order to ensure the sustainable prosperity of the country.





TABLE 1 • Annual economic value of marine and coastal ecosystem services in Vanuatu (2013)

Sector	Ecosystem service	Beneficiaries	Net annual value ^{1,2} (2013 adjusted) m = millions	Sustainability ³
Fisheries	Subsistence fishing	Ni-Vanuatu households, particularly rural and low-income	VT 578m (US\$ 6.5m)	Sufficient inshore habitat for sustainable subsistence harvests, but localized overfishing has reduced productivity, threatening sustainability
	Small-scale commercial reef, invertebrate, and deep-slope fisheries	Ni-Vanuatu fishers and consumers, some restaurants and businesses (only value to fishers is estimated)	VT 294m (US\$ 3.3m)	As above, reef fishery may receive localized overfishing. Traditional fishing methods and lack of market development limits pressure on deep-slope demersal fishery
	Bêche-de-mer	Mostly export companies and foreign consumers, some small-scale fishers/divers, some government revenue (value includes fishers and exporters)	VT 4.5m (US\$ 0.05m)	Over-harvesting has led to periodic closures; new management regime should be sustainable if enforced
	Aquarium trade	Mostly foreign export companies, some government benefits (not included in value)	VT 13.4m (US\$ 0.15m)	Unknown; monitoring and management plan is being developed
	Trochus	Small-scale fishers, local and foreign consumers, exporters; some government revenue (value includes fishers and exporters)	VT 8.9m (US\$ 0.1m)	Historic over-harvesting has depleted stocks, but management efforts are being improved
	Recreational game fishing	Charter fishing companies in Efate and Santo and foreign visitors (value represents fishing guide revenue and representative value of fish caught)	VT 142m (US\$ 1.6m)	Unknown impact upon Marlin and other pelagic game fish; not all harvests are recorded, some catch-and-release
	Offshore tuna	Foreign fishing fleets, government, some local workers (value represents only government revenue from license fees and treaty fees)	VT 160m (US\$ 1.8m)	Albacore longline fishing sustainable, Yellowfin threatened and Bigeye overfished. Bycatch threatens sharks and some pelagic fish
Mining	Sand and aggregate	Data only for modest government benefits and estimated value as a raw product. Costs could not be estimated	VT 15.1m (US\$ 0.17m) (gross)	Beach mining for construction and household uses is unsustainable and needs monitored to prevent diminishing fishing and tourism ecosystem services
	Deep-sea minerals	International mining companies; government and local economic benefits depends upon taxes, royalties, and business operations	Insufficient data	Potential risks to pelagic fisheries (tuna and game fishing) and dive tourism are unknown
Tourism	Tourism and recreation	Vanuatu businesses (local and foreign owned) and government; benefits to international tourists not included	VT 613–1,095m (US\$ 6.9–12.3m)	Sustainable, if human pollution and damage is prevented
Regulating services	Coastal protection	Citizens and visitors, in particular owners of coastal properties (measures avoided repair costs)	VT 1,226–2,043m (US\$ 13.7–23m)	Sustainable if reef is living
	Carbon sequestration	Global benefit; potential benefit to communities from carbon credits (not included in value)	VT 1.8–760m (US\$ 0.02–8.5m)	Sustainable, if mangroves and seagrasses are protected
Foreign investment	Research, education, management	Mostly government; aid money trickles through economy to organizations, consultants, and businesses	VT 434m (US\$ 4.9m)	Depends on international relations and agreements related to nature conservation

1 Different beneficiaries (local, foreign, producer, consumer, government) are included in the value estimates; read beneficiaries column for explanation and exceptions. Gross values do not reflect costs. An exchange rate of Vt 89 to US\$ 1 is used throughout the report.

2 Unless otherwise indicated.

3 Sustainability refers to whether the values presented can be expected to decrease (unsustainable), increase, or stay the same (sustainable) with current human behaviours.