NATIONAL MARINE ECOSYSTEM SERVICE VALUATION

SUMMARY REPORT

SOLOMON ISLANDS

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MACBIO

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 Solomon Islands' 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**.

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SUMMARY REPORT

SOLOMON ISLANDS

PRINCIPAL AUTHORS: Marco Arena[1]

CONTRIBUTING AUTHORS: Lysa Wini[2], Jacob Salcone[3], Guillaume Leport[4], Nicolas Pascal[5], Leanne Fernandes[3], Luke Brander[6], Hans Wendt[3]

EDITOR: Andrew Seidl[7]

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AUTHOR AFFILIATIONS

1 Resource and environmental economist —Independent consultant

2 Environment Conservation Division, Ministry of Environment, Climate Change, Disaster and Meteorology, Honiara, Solomon Islands

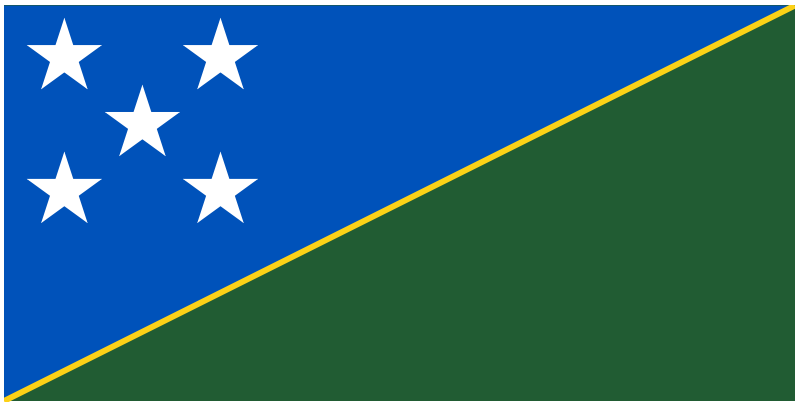
3 MACBIO project, IUCN Oceania Regional Office, Suva, Fiji

4 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

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

6 Brander Environmental Economics, Hong Kong

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



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This study, conducted in 2015, aimed to determine the economic value of seven marine and coastal ecosystem services in the Solomon Islands. 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 recognize 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 and biodiversity provide Solomon Islands businesses, households, and government many real and measurable benefits. The exclusive economic zone of the Solomon Islands, nearly 1.6 million 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 Solomon Island'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. The 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.

INSHORE FISHERIES

Small-scale inshore fishing and gleaning for home consumption and sale at local markets provides food security and incomes for many Solomon Islands households. The subsistence and inshore commercial fisheries depend on the health and productivity of reef, lagoon, and mangrove areas. Using household catch data from four villages and sales estimates from previous studies, total artisanal harvest is estimated to be about 55,957 tonnes per year. Of this about 57% is the subsistence proportion and is consumed at home (31,547 tonnes) while 43% (22,410 tonnes) is sold.

SUBSISTENCE FISHING

The subsistence harvest is worth an approximate net economic value of SI$ 442.2 million per year (US$ 58.9 million). There are concerns regarding the sustainability of this ecosystem service, although it varies across different provinces. Localized resource pressure is the result of a high rate of population growth, high proportion of fish consumption in coastal villages, and the use of destructive fishing practices such as dynamite and fish poisoning. Guadalcanal and Malaita coral reefs are heavily exploited, while provinces with lower population density such as Temotu and Isabel, which have the lowest catches per hectare of reef, may have a more sustainable subsistence fishery.

SMALL-SCALE COMMERCIAL FISHERIES

Although only 5,000 Solomon Islanders are employed by formal fisheries-related (non-government) jobs, an estimated 30,000 Solomon Islanders work in semi-commercial or artisanal fisheries. Small-scale fisheries in the Solomon Islands include reef fish and invertebrates, *bêche-de-mer,* trochus, and the aquarium trade. Reef fish and some invertebrates are sold locally; *bêche-de-mer,* trochus, and aquarium products are harvested for export. Although the value of these activities is low compared to the subsistence and tuna fisheries, they provide important cash income for Solomon Islanders. Fish and invertebrates sold in local markets account for a total economic value of SI$ 70.3 million per year (US$ 9.4 million), which corresponds to SI$ 156/year/person and 0.8% of the total nominal GDP of Solomon Islands. The economic value is much less than the subsistence fishery because of the costs of bringing fish to market. The sustainability of subsistence and small-scale commercial fishing are interrelated. The fisheries are threatened where population is most dense.

Bêche-de-mer and trochus are highly valued on international markets. Catches and exports from 1999 to 2010 have accounted for an average annual gross export value of SI$ 3.3 million (US$ 446,000) and SI$ 2.1 million (US$ 284,000) respectively. These values have been decreasing steadily for the past 40 years. Trochus is also valuable locally, so the figure above underestimates the total economic value of the ecosystem service. Despite periodic export moratoriums, both fisheries are overexploited and not sustainably managed. Aquarium trade exports from 1999 to 2010 have accounted for on average SI$ 1.2 (US$ 163,000) million per year. Although the magnitude of this ecosystem service is small, it appears sustainable. Control over the use of destructive fishing practices should be strengthened as it may negatively impact other fisheries.

All of these sectors provide income to coastal communities in the Solomon Islands, although most of the value of *bêche-de-mer*, trochus, and the aquarium trade accrues to foreign exporters. Costs are high for the aquarium trade and *bêche-de-mer* sectors so net benefits are lower. Government management efforts are focused primarily on the export industries, despite the fact that the net benefits to communities and households are much larger for subsistence and local market fisheries.

OFFSHORE COMMERCIAL TUNA FISHERY

The tuna fishery in Solomon Islands is the fifth largest of the Pacific island countries. Skipjack is the dominant commercial tuna species in Solomon Islands, making up 64% of the annual catch, followed by yellowfin (25%), albacore (7%), and big eye (4%). Almost all (99%) of the commercial tuna catch is harvested by foreign fishing vessels, mostly by purse seine. Scientists report that yellowfin stocks show signs of overfishing and bigeye stocks are becoming dangerously small, but that albacore and skipjack stocks remain healthy. Although skipjack makes up the majority of tuna catch in the Solomon Islands, it represents only 30% of the total value.

The net economic value of the tuna fishery in the Solomon Islands amounts to US$ 221,089,000 (~SI$ 1,659,827,300). Although there are some local processing facilities, much of the catch is trans-shipped to distant markets, limiting the positive economic impact of the industry for the Solomon Islands. The Solomon Islands government earns significant revenue from licensing of foreign fishing vessels, more than SI$ 217 million in 2014 (US$ 29 million), and the industry provides some employment on fishing vessels and at processing and canning facilities. Membership to the Parties of the Nauru Agreement (PNA) is improving sustainability and greatly increasing revenue earned from foreign vessel licenses.

DEEP-SEA MINING

Although only one deep-sea mining operation is currently active in the Pacific (in Papua New Guinea), all Pacific island countries are interested in the potential costs and benefits of this ecosystem service. Solomon Islands recently issued prospecting licenses to explore specified areas within its waters in order to analyze the presence of mineral resources and feasibility of extraction. Exploration for deep-sea mining opportunities is already providing benefits to Solomon Islands government from various fees: SI$ 2.74 million in 2012 (~US$ 364 000) and SI$ 998,200 (~US$ 133,000) in 2013. While this an important benefit, it is likely to represent only a fraction of the value of the resource. The majority of the benefits are likely to accrue to foreign mining companies and the industries that use the minerals. The net benefit of deep-sea mining depends on the market prices of minerals extracted, the extraction costs, and the costs of environmental damages or *externalities*. Since the extraction costs and externalities are largely unknown, a true valuation of deep sea mineral mining is not yet possible. The magnitude of threats to offshore fishing and recreational diving and fishing cannot yet be quantified, but must be considered. Tourism and tuna industries provide substantial sustainable benefits to Solomon Islands and may be impacted by deep sea mining.

TOURISM

The Solomon Islands has a small, but expanding, tourism industry. Tourism expenditures from foreign visitors amount to about SI$ 516 million per year (US$ 68 million). According to a preliminary survey designed to estimate the contribution of marine ecosystem services to the tourism sector, 22% or SI$ 118.7m (US$ 15.8m) Gross export value are related to marine ecosystems. Tourism benefits a variety of businesses and their employees and provides government tax revenue. If managed responsibly, tourism can be a lucrative and sustainable ecosystem service. Because tourists generally seek out healthy ecosystems, tourism can create an incentive to protect and even rehabilitate marine ecosystems. The case of the Marovo lagoon is emblematic. If tourism was more developed and profitable, there would have been a higher incentive for the local government and the community to stop illegal logging and, possibly, the area may have been listed as UNESCO World Heritage site as envisaged a few years ago. Mining and fishing, particularly destructive types of inshore fishing, could negatively impact tourism benefits.

COASTAL PROTECTION

Fringing reefs, mangroves and seagrasses protect Solomon Islands' coasts from erosion and flooding. The *avoided costs* method was used to analyze their value. The value of coastal protection provided by coral reefs against damage from storm surges in Guadalcanal is estimated to be in the range of SI$ 25–48 million annually (US$ 3.3–5.6 million). The scope of this assessment is restricted to only one aspect of coastal protection (cyclone damage), considers only damage to houses and hotels, and is limited in geographic extent (Guadalcanal). The full value of this ecosystem service for Solomon Islands is likely to be considerably higher.

CARBON SEQUESTRATION

Solomon Islands' mangroves provide carbon sequestration benefits to the world, worth about SI$ 161.9m (US$ 21.6m) each year. Mangroves are being destroyed at an alarming rate (-1.7%/year). If protected, areas of mangroves and seagrass at risk for destruction could be marketed and sold as carbon offsets, but the costs of verifying and managing the protected areas would need to be assessed on a case-by-case basis. The potential revenue from the sale of carbon offsets for the protection of stored carbon in mangroves is estimated to be in the range of SI$ 55.1–72.8 million/year (US$ 7.3–9.69 million/year).

RESEARCH, MANAGEMENT, AND EDUCATION

Marine and coastal areas attract foreign aid and research funding that benefits the Solomon Islands. Investment in marine and coastal biodiversity includes many projects run through the Fisheries and Environment departments. Data were not available to estimate the total economic value for the Solomon Islands. In 2013, donor supported fisheries projects alone totaled SI$ 9.2 million (US$ 1.2 million). This is a minimum estimate of the value of marine research and management in the Solomon Islands. These funds benefit 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 and human and financial resources, but they indeed provide benefits to Solomon Islands citizens and the rest of the world.

CONCLUSIONS

In preparing this report, accessing reliable data was difficult. As such the figures contained represent both gross values and values net of costs (i.e., true economic value).

The majority of Solomon Islands' marine ecosystem service benefits come from subsistence and small-scale fishing for local sale, 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 Solomon Islands. The tuna industry is the most valuable of all marine ecosystem services in the Solomon Islands, but most of the economic value accrues to foreign fishing fleets.

Discussions led and facilitated by the Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM) and including the Ministry of Fisheries and Marine Resources (MFMR) have been fundamental for the development of this ecosystem service valuation. Throughout the development of this report, the authors endeavored to share information about the economic value of marine ecosystems with a wide range of government departments and stakeholders that have a role in marine resource use and management. These discussions indicated an awareness and understanding that economic valuation information can inform development and implementation of marine resource management policies, and legislation and regulation of marine activities and, in fact, identified several specific uses for these results as outlined in the report.

This study is a step towards a national process of recognizing the human benefits of natural ecosystems, which will lead to more equitable and sustainable management of Solomon Islands' marine assets. These results can serve as an inventory of current information about the economic value of Solomon Islands' marine and coastal assets and as a starting point for more in-depth valuations of each of the ecosystem services discussed above. More generally, Solomon Islands 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 Solomon Islands (2013)

Sector	Ecosystem service	Beneficiaries	Net annual value[1,2] (2013 adjusted) m = millions	Sustainability[3]
Fisheries	**Subsistence fishing**	Solomon Island households, particularly rural and low-income	SI$ 442.2m (US$ 58.9m)	Sufficient inshore habitat for sustainable subsistence harvests, but high population growth, lack of alternative protein sources, and destructive fishing practices threatens sustainability
	Inshore coral and demersal fish	Solomon Island fishers and consumers, some restaurants and businesses (only value to fishers is estimated)	SI$ 70.3m (US$ 9.4m)	As above, reef fish and invertebrates receive localized overfishing. Population pressure, and destructive fishing practices threaten sustainability
	Bêche-de-mer	Mostly export companies and foreign consumers, some local fishers, some government revenue	SI$ 3.3m (US$ 446,000) Gross export value	Over-harvesting has led to periodic closures, but inconsistent and difficult to enforce. Not sustainably managed
	Aquarium trade	Mostly foreign export companies, some government benefits and local harvesters	SI$ 1.2m (US$ 163,000) Gross export value	Unknown, but export quantities are small. Some destructive practices need monitored and controlled
	Trochus	Small-scale fishers, local and foreign consumers, exporters; some government revenue	SI$ 2.1m (US$ 284,000) Gross export value	Decades of overharvesting has depleted stocks to a condition of very low productivity in some areas
	Offshore tuna	Foreign fishing fleets, government, some local processing and fishing jobs (value is sum of goverment revenue and industry net economic value)	SI$ 1,659.8m (US$ 221.1m)	Skipjack stocks appear sustainable, yellowfin threatened and bigeye overfished. Membership in the PNA is improving government revenue and sustainability
Mining	**Deep sea minerals**	International mining companies; government and local economic benefits depends on taxes, royalties, and business operations	SI$ 998,200 (~US$ 133,000)	Sustainability unknown; potential risks to tuna fishery, recreational fishing, and dive tourism
Tourism	**Tourism and recreation**	Solomon Island businesses (local and foreign owned) and government (marine and coastal tourism)	SI$ 118.7m (US$ 15.8m) Gross export value	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)	SI$ 25–48m (US$ 3.3–5.6m)	Sustainable if reef is living
	Carbon sequestration	Global benefit; potential benefit to communities from carbon credits (not included in value)	SI$ 161.9m (US$ 21.6m)	Sustainable, if mangroves and are protected
Foreign Investment	**Research, education, management**	Mostly government; aid money trickles through economy to organizations, consultants, and businesses (value reflects fisheries projects only)	> SI$ 9.2m (US$ 1.2m)	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 SI$1 = US$0.1332 has been 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 behaviors.