



Marine Conservation

How Economic Valuation of Ecosystem Services Can Help

Marine ecosystem services are seriously undervalued, resulting in underinvestment in conservation and lost opportunities for economic growth and poverty reduction. Economic valuation provides stakeholders with a powerful tool for decision making by showing how dependent the economy is on an ecosystem and what would be lost if the ecosystem is not protected. When integrated with the national income accounts, economic valuation can help two distinct but equally important groups: (1) line ministries, the private sector, and civil society organizations directly involved in the use and management of the marine ecosystem and (2) agencies with responsibility at the macroeconomic level—like the Ministry of Finance—that control the national budget and make policies that indirectly affect the marine ecosystem. The former are often quite receptive to valuation studies, which can clearly help them with management. The latter have no direct responsibility for the marine ecosystem and must be convinced that they, too, have a stake in sustainable ecosystem management.

To engage decision makers at the macroeconomic level, we must demonstrate what their stake is. We do this by integrating ecosystem values with national income accounts to show the ecosystem's influence on the major indicators of macroeconomic performance, such as the contribution to GDP, employment, and the balance of payments. But it is not sufficient just to estimate values; the distribution of benefits is crucial both for sector-level managers and macroeconomists.

At the sectoral level, information about the distribution of benefits contributes to improved management. Countless studies have shown that incentives for sustainable management are strongest when benefits accrue to those who steward natural resources. At the macroeconomic level, policy makers in many countries have adopted development plans in which poverty reduction has joined the traditional macroeconomic goals of economic growth and stability. Valuation that shows the distribution of incomes from marine ecosystem services, especially the share accruing to poor communities, can

demonstrate to macroeconomists the role of sustainable marine ecosystem management in achieving poverty reduction goals.

The Earth Institute at Columbia University and the Institute of Marine Sciences, University of Dar Es Salaam, collaborated to apply this “environmental accounting” approach to the economic valuation of marine ecosystems in Zanzibar.

Economic Growth and Threats to the Marine Ecosystem

Zanzibar is a small, densely populated island archipelago off the coast of Tanzania with many endangered and rare species of corals, fish, seagrass, mangroves, and other flora and fauna. Its population of 1.1 million is highly dependent on the marine ecosystem, which accounts for 30 percent of GDP. But despite its clear economic importance, the marine ecosystem is seriously degraded due



Glenn-Marie Lange

to both human and natural causes, including uncontrolled tourism development, rapid population growth, overfishing and destructive fishing practices, overharvesting of mangroves, dumping of untreated wastewater from urban areas, and periodic coral bleaching. Why has this happened?

Twenty-five years ago, local communities in Zanzibar were responsible for managing the marine ecosystem and received all the benefits. Harvesting of fish and other marine products was the only major marine activity. Since then, tourism has grown rapidly, largely to take advantage of the island’s spectacular beaches and coral reefs and its rich cultural heritage, which merited designation as a World Heritage Site. From 1985 to 2007, Zanzibar’s tourism-based economy experienced rapid growth—annual tourist arrivals increased from about 19,000 to 220,000. However, the impact of this growth on the marine environment was largely overlooked. Furthermore, local communities had little stake in the new economy.

We wanted to understand why degradation of the ecosystem occurred in Zanzibar and identify opportunities to promote marine conservation and sustainable development in the future. To do so, we explored the value of marine ecosystem services in the macroeconomy, how economic benefits are distributed among different stakeholders, and the incentives or disincentives this creates for marine conservation.

Marine Ecosystem Services and the Macroeconomy

Poverty is extensive in Zanzibar; roughly 50 percent of the population falls below the poverty line, and average per capita GDP was only \$415 in 2007. The major marine-based economic activities include tourism, fishing, seaweed farming, and mangrove harvesting. They account for 30 percent of GDP, 77 percent of investment, a large share of formal sector employment, and most of the nation’s foreign exchange earn-

ings (see *Table*, below). Tourism is by far the most economically important marine ecosystem service, accounting for most of the income, foreign exchange, and investment. However, it does not generate very much employment—and many of those employed are non-Zanzibaris or Zanzibaris from outside the local communities where tourism activities are based.

There are several additional, but unpriced, marine ecosystem services. Education and research services are provided through several institutions of local, regional, and international significance. Critical regulating services include habitat for fisheries, wastewater assimilation, and control of beach erosion by seagrass beds and coral reefs. These nonmarket services are what economists call “indirect” ecosystem services because their economic value derives from their use as an input to something else that has direct economic value, such as fisheries or the viewing of coral reefs by tourists. The ecological information necessary for economic valuation is not currently available, but evidence from around the world indicates that these services have a high value.

TABLE Contribution of marine ecosystem services to the macroeconomy in Zanzibar, 2007

	GDP (income generated, thousand \$)	Share of GDP (%)	Foreign exchange earnings (thousand \$)	Employment	Share of investment, 2003–2007* (%)
Provisioning services					
Seaweed farming	1,663	0.4	2,397	16,422	
Fishing**	29,179	6.2		37,203	1
Mangrove harvesting	28			unknown	
Recreation and tourism services					
Total value	150,506	30.2	187,326	62,976 +	77
Other ecosystem services, nonmarket					
Education and Research			Value unknown, but likely to be significant		
Regulating services: Fisheries habitat, wastewater assimilation, shore protection			Value unknown but likely to be significant		

Notes: Blank indicates negligible or zero value.

*Cumulative value of investment projects approved by the Zanzibar Investment Promotion Authority.

**Only artisanal fishing is included here, not deep-sea fishing, which is licensed to foreign operators.

Source: Adapted from Lange and Jiddawi (forthcoming).

Who Benefits from Marine Ecosystem Services in Zanzibar?

Of the major economic activities based on the marine ecosystem, all but tourism deliver most of their benefits to local communities (see *Table*, below). Local communities receive only 20 percent of income from tourism, while 80 percent of income goes to stakeholders outside local communities: other Zanzibaris (13 percent), government (15 percent), and non-Zanzibaris (52 percent).

Commercial Seaweed Farming. Commercial seaweed farming was introduced in the late 1980s and now involves more than 16,000 farmers, mainly women. Seaweed provides carrageenan, a thickening and gelling agent used mainly in processed foods, dairy products, and other products such as toothpaste. The raw material is sold to a few companies for export—too little is grown

Glenn-Marie Lange



to support local processing. Most farmers earn very little due to a combination of low global prices for seaweed and low farm productivity; even the exporters currently earn very little under current market conditions. The role of seaweed farming in economic development is controversial, but for many rural women it is still the only source of cash income.

Fishing. Fishing is mainly an inshore, artisanal operation involving about 34,000 fishers and another 3,000 people in the transport and marketing sectors. (Foreigners are licensed to fish offshore within the 200-mile EEZ.) Nearly half the vessels are dugout canoes; only 11 percent of boats are motorized. In 2007, the catch was nearly 26,000 tons, most sold without further processing in local markets. Overfishing and destructive fishing practices have contributed to the decline of Zanzibar's marine ecosystem. But in an environment of low incomes and rapid population growth in largely unregulated, open-access fisheries, there is insufficient incentive to change. Changing this behavior would require much greater involvement with—and income from—activities that depend on healthy coral reefs and fisheries.

Mangrove Harvesting. Mangrove harvesting is presently a minor activity because of the massive loss of mangrove forests, particularly on the main island of Unguja. Only an estimated 20,000 hectares of mangroves remain, mostly on Pemba.

Tourism. Tourism is by far the most important ecosystem service in terms of macroeconomic indicators. But the benefits of tourism mostly go to non-Zanzibaris rather than local communities. Furthermore, within the dominant segments of the tour-

TABLE Distribution of income from marine ecosystem services in Zanzibar, 2007 (thousand \$)

	Zanzibari beneficiaries				Non-Zanzibari beneficiaries	Total
	Local communities	Zanzibaris outside local communities	Government			
Provisioning services						
Seaweed farming	1,616		46			1,662
Fishing*	29,179					29,179
Mangrove harvesting	28					28
Recreation & Tourism services						
Total value	54,726	15,211	17,541	63,028		150,506
Other ecosystem services, nonmarket						
Education & research	X	XX	XX	XX		NA
Regulating services						
Fisheries habitat	XX	X	X	X		NA
Wastewater assimilation	XX	X	X	XX		NA
Shore protection	XX	X	X	XX		NA

Notes: Blank indicates zero or negligible value.

NA: not available

*Only artisanal fishing is included here, not deep-sea fishing, which is licensed to foreign operators.

"X" indicates the relative importance of service to the stakeholder group for services that cannot be precisely valued. "XX" is greater than "X."

Source: Adapted from Lange and Jiddawi (forthcoming).

ism industry—all-inclusive, “club” tourism, and large, up-market tourism—economic incentives for marine conservation are not strong. Many of these tourists go for boat rides or spice-farm tours, or simply enjoy the beach, but do not participate as much as other tourists in activities like snorkeling or diving, where the health of coral reefs and fisheries is essential. The government obtains much of its revenue from these segments of the tourism industry, so it also has less incentive to make marine conservation a priority. By contrast, tourists in the small, up-market segment participate the most in diving and snorkeling and have the highest average daily spending, but constitute the smallest segment of the tourist market.

Nonmarket Ecosystem Services. Nonmarket ecosystem services have not been valued, but it is possible to rank the benefits received by different stakeholders. All stakeholders benefit, but local communities—whose livelihoods from fishing, seaweed farming, and tourism depend most heavily on these services—benefit the most.

Conclusions and Recommendations

Unless there are shared incentives for sustainable management, the future of Zanzibar’s marine ecosystem is not promising. Greater local participation in the tourism economy will help, but only if tourism policy favors ecotourism, which has the greatest

stake in marine conservation. Increased productivity in seaweed farming and reduced losses from fishing can help increase local incomes, but large increases in income will only come from tourism. Initiatives to increase the provision of local goods to hotels and restaurants will help. Greater participation in tourism will require improvements in education. The development of high-end tourism will require substantial improvements in infrastructure.

Zanzibar, like many countries, has set a goal for tourism development in terms of a target number of annual visitors. A better approach would be to set a target revenue stream and promote the kind of tourism that meets that target with the least impact on the environment and most benefit for society. On Unguja, Zanzibar’s main island, it may be too late because of the large number of big hotels already built. But it is possible to reconsider policy for Pemba, a relatively pristine island with great ecotourism potential.

The institutional challenge, common to most countries, is the fragmentation of decision making and management; no single agency has responsibility for all activities affecting the marine ecosystem. Comprehensive economic valuation can help overcome fragmentation and build a broad, cross-sectoral alliance of stakeholders by quantifying the common interests and mutual dependence of different stakeholders, and providing a scientific basis for assessing trade-offs among options for development.

Policy makers worldwide increasingly recognize the importance of economic valuation, but several aspects critical for policy have often been neglected, such as (a) bringing natural capital into the national income accounts in order to involve stakeholders both at the sectoral and macroeconomic levels; (b) analyzing the distribution of economic benefits to understand the incentives and disincentives for sustainable management; and (c) accurately valuing the nonmarket, regulating ecosystem services that underpin the marine economy. To promote marine conservation, we need (a) a global database of economic valuation studies of marine ecosystems that can be used by governments, communities, the private sector, and other stakeholders in development planning; (b) more training of local environmental economists to carry out economic valuation studies; (c) increased dialogue among stakeholders (scientists, local users and managers of ecosystems, governments, private sector, NGOs) to understand how to interpret and best use valuation studies; and (d) increased collaboration between economists and natural scientists to provide accurate, policy-relevant valuation of indirect ecosystem services like habitat provision and storm protection.

Bibliography

World Bank. 2008. *Valuation of Marine Ecosystem Services: Gap Analysis*. Environment Department. Washington, DC: World Bank.

Lange, G., and N. Jiddawi. (forthcoming.) “Environmental Accounting for Marine Ecosystems as a Tool to Promote Conservation.” Draft final report for the Pew Fellowship Program in Marine Conservation. Available at: <http://www.columbia.edu/~gl2134/>

This article was prepared by Glenn Marie-Lange (GL2134@columbia.edu) of the Earth Institute at Columbia University and Narriman Jiddawi (njiddawi@ims.udsm.ac.tz) of the Institute of Marine Sciences at the University of Dar es Salaam. Columbia University website: www.columbia.edu. University of Dar es Salaam website: www.udsm.ac.tz.



Glenn-Marie Lange