

the value of nature

Ecological, Economic, Cultural and
Social Benefits of Protected Areas



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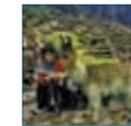
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The Secretariat of the Convention on Biological Diversity invited a number of authors to contribute case studies on the ecological, economic, social and cultural benefits of protected areas for publication in the CBD Technical series No. 36. This brochure, more specifically meant for policy and decision-makers, summarizes those cases and includes additional information from recent publications. Specific references and sources for the case studies included in this brochure can be found in the CBD Technical series No. 36.

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for biodiversity

Protected areas, besides being cornerstones of biodiversity conservation, constitute an important stock of natural, cultural and social capital, yielding flows of economically valuable goods and services that benefit human populations. The positive contribution of protected areas to the livelihoods of the poorest and most vulnerable sectors of society is very high indeed. Protected areas also provide key support to the maintaining of cultural traditions and the building of social capital. Moreover, as unprecedented climate change becomes a reality, protected areas are key to buffering the inevitable yet unpredictable impacts. In fact, evidence shows that well managed protected areas yield significant benefits, which can be translated into cumulative advantages across a national economy. Without these important components, sustainable development and achievement of the Millennium Development Goals may well be an insurmountable task.

Land and sea areas dedicated to conservation are the world's shining green emeralds and blue sapphires. Unfortunately, their value is poorly understood and greatly undervalued by markets, politicians and the general public. Their value does not register in conventional markets and they are therefore not considered to be real economic assets by policy-makers. As a result, protected areas do not receive crucial national budget prioritization and, lamentably, more often than not, funding is lacking for their creation and management. And yet, the critical and obvious links between protected areas, biodiversity conservation and economic development are there for all to see.



This brochure is an attempt to illustrate the ecological, economic, social and cultural benefits of protected areas, in order to generate a stronger call to action for policy-makers and other stakeholders. At two years away from the 2010 biodiversity target, there is a need to expand coverage of protected areas and improve their representativeness and effectiveness. There is a need to stimulate political will as well as enhance human and financial resources. One way to promote these needs is to describe the many benefits of protected areas in a more comprehensive and convincing way.

I thank all the contributors and Conservation International for preparing this document. I express my deepest gratitude to the Governments of Belgium and Italy for making available the necessary financial resources to publish this brochure in time for the second meeting of the Ad Hoc Open-Ended Working Group on Protected Areas. I trust that it will be of value to many far and wide.

Dr. Ahmed Djoghlaoui
Executive Secretary, Convention on Biological Diversity

INTRODUCTION

Benefits of Protected Areas

The overwhelming purpose and scope of the CBD programme of work on protected areas is to support the establishment and maintenance of comprehensive, effectively managed and ecologically representative national and regional systems of protected areas that contribute to achieving the three objectives of the Convention: the 2010 biodiversity target, the pursuit of sustainable development including poverty reduction, and the Millennium Development Goals. The programme of work on protected areas enshrined the principle of pro-poor conservation. However, donor agencies and decision makers often perceive protected areas as preventing economic development. This brochure gives a few examples showcasing that, for most of them, this is not the case. By possessing and protecting both material and non-material riches, protected areas play a key role in the economic and social welfare of humanity, as well as the ecological health of the planet. Protected areas provide valuable and numerous benefits to:



- » Protect biological diversity and ecological and evolutionary processes
- » Prevent and reduce poverty by supporting livelihoods, providing social and cultural governance and subsistence values, and maintaining ecosystem services
- » Ensure breeding grounds for wildlife and fish, critical to the food security of hundreds of millions of people
- » Protect commercial fisheries from collapse
- » Provide medicinal plants, biochemical components for the pharmaceutical industry and ecological balance that controls and acts as a barrier for diseases (e.g. malaria) and epidemics
- » Hold important plant genetic resources for food and agriculture, including endemic and threatened crop wild relatives as well as land races for food production
- » Filter and supply fresh water for both rural and urban populations around the world
- » Mitigate the effects of natural disasters by acting as barriers and buffer zones for storms, floods and drought



- » Provide capacity to adapt to climate change
- » Act as enormous natural carbon sinks and play a key role in global climate regulation
- » Generate tremendous direct economic benefits, and serve as a key asset for the tourism industry—critical to the economies of the majority of less developed, developing and island states, and one of the world's largest economic engines
- » Offer space for people to enjoy recreation as well as spiritual and physical renewal
- » Hold irreplaceable and immeasurable spiritual value for particular communities and faiths
- » Protect the territories and rights of indigenous and local communities providing them the resources and space to continue traditional lifestyles and retain control of their destinies
- » Facilitate governance mechanisms that enhance social

capital and bring together a diversity of stakeholders at different levels, from trans-boundary conservation areas and peace parks, to local and municipal areas managed by collections of stakeholders

The benefits of protected areas extend spatially far beyond their boundaries. In order to support and augment these benefits, consideration of protected areas must be incorporated into wider sustainable development and economic strategies. Their benefits and values need to be recognised and showcased. Moreover, their governance needs to be made more participatory and equitable. Protected areas are not a panacea to achieve sustainable development and poverty reduction per se but they do constitute a central element for achieving the three objectives of the Convention. The following pages provide concrete examples of ecological, economic, social and cultural benefits of protected areas.



Many people in rural areas depend on protected forests, pastures, wetlands and marine areas for their livelihoods. Protected areas, when carefully designed and managed, can contribute to poverty reduction and sustainable development including the achievement of the Millennium Development Goals. The provisioning services (food, fuel, fresh water and herbal medicines) of protected areas have direct use and value to rural communities.

Ensuring environmental sustainability is one of the Millennium Development Goals. One of the indicators to measure progress towards this goal is the percentage of areas under protection. There is increasing recognition that conservation efforts supporting protected area creation and management are essential to achieving the other Millennium Development Goals, since these areas maintain healthy ecosystems and their services. Yet biodiversity loss and ecosystem degradation pose a significant threat to the achievement of Millennium Development Goals.

- » Nearly 1.1 billion people worldwide depend on forest-protected areas for their livelihoods, and that forest-related income provides a significant share of total household income. Marine and inland water protected areas serve as an excellent source of substantial income and food security from fishing for poverty-stricken households.
- » A study in Cambodia has shown that fuel wood, fishing and other resources provided by mangrove-protected areas, constituted 20-58% of household incomes, with heavier reliance among poorer households.
- » The 50,000 residents of Lupande Game Management Area in Zambia raise annual revenue of US\$ 230,000 (representing 80% of the total revenue) from two hunting concessions.
- » The Maya Biosphere Reserve in Guatemala generates an annual income of approximately US\$ 47 million and provides employment to 7,000 people.
- » Pollination services of protected areas in South Africa's Cape Region are worth approximately US\$ 400 million annually.
- » Wetland and woodland products from the community-managed Mtanza-Msona Village Forest Reserve, adjacent to the



Selous Game reserve in Tanzania, are worth almost eight times as much as all other sources of farm production and off-farm income of the poorest household in the village. The value of the wide range of wild foods harvested from wetlands is more than 14 times that of household's average annual expenditures on food from market.

- » Marine protected areas (MPAs) help empower women economically and, in some cases, socially. In Navakavu MPA in Fiji, women are the reef gleaners and benefit financially by collecting and selling the bountiful shellfish from just outside the marine protected area. In MPAs of Bunaken in Indonesia and Apo Islands in the Philippines, diving tourism created more high-income job opportunities for women, improving their lives. In the Arnavons MPA in Solomon Islands, women gained a stronger voice in community meetings when they became involved in the income earning activities of seaweed farming and traditional clothes making.



Forest protected areas in Lao Peoples Democratic Republic (PDR) provide 61-79% of the non rice food consumption by weight; fuel wood serves as the primary energy source for more than three quarters of the population; and non-timber forest products alone comprise nearly half of the household subsistence and cash income.

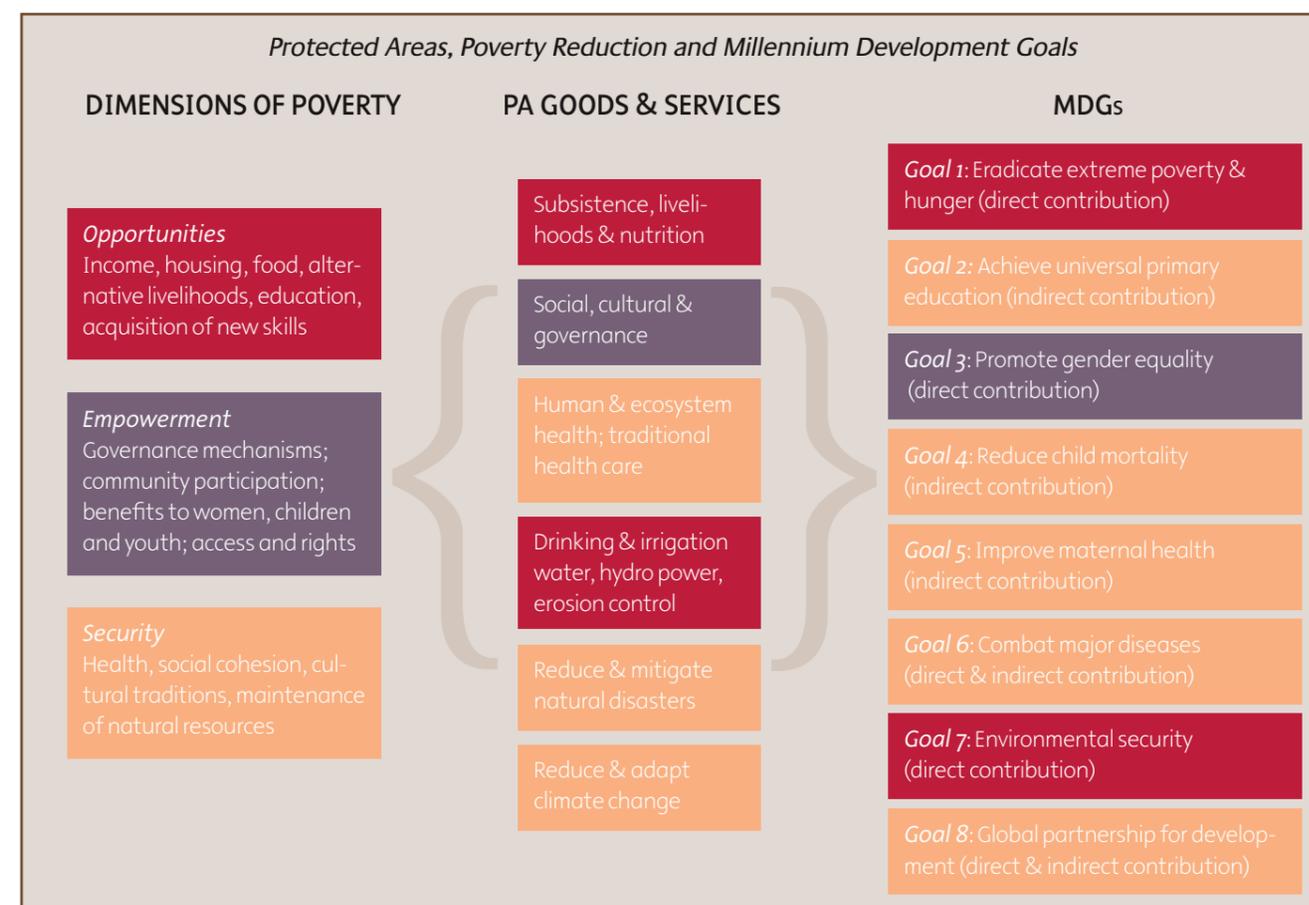
Protected areas in Lao PDR, through ecosystem goods and services, contribute directly or indirectly to three quarters of per capita GDP, providing more than 90% of employment, constituting almost 60% of exports and foreign exchange earnings, nearly half of foreign direct investment and two thirds of donor assistance.

The Nam Et and Phou Loei Protected Areas in Lao PDR, on average, contribute around a quarter of the household cash income and 40% of the total production and consumption of 24,000 people. Each year, the villagers use 165 kg of wild plant products and 141 kg of wild meat deriving from these two protected areas at the household level.

THEME 1

Protected Areas and Livelihoods

Poverty Reduction and Millennium Development Goals



THEME 2

Protected Areas and Climate Change Resilience, Adaptation and Mitigation

Protected areas can serve as important elements of climate change adaptation and mitigation. By conserving unbroken blocks of intact habitat, protected areas increase the ecosystems' resilience to climate change since ecosystems with high biodiversity and intact structural components recover more easily from climatic disturbances. Furthermore, protected areas can provide protection against physical impacts of climate change such as rising sea levels, rising temperatures and extreme weather events.

Sea level rise and increased storm damage put coastal communities and small islands at particular risk. Building physical barriers against the rising sea is technically difficult and expensive, especially for countries with large, low-lying coastal regions. Natural features such as coral reefs and mangroves are the most cost-effective options for maintaining coastal integrity. The value of mangroves as coastal protection has been estimated to be as much as US\$ 300,000 per kilometre of coastline.



Finally, shifting upward or pole-ward is predicted to be one of the most common responses of species to the impacts of climate change. Protected areas, particularly corridors, will have an important role to play in providing habitat to facilitate such shifts so as to maximize the natural adaptive capacity of biodiversity.

Protected areas also contribute to climate change mitigation since carbon sequestration is one of the natural ecosystem services of protected areas. They are enormous natural carbon sinks and play a key role in global climate regulation. Approximately 20-25% of global greenhouse gas emissions result from the conversion of forests and other ecosystems. Protected areas often act as important barriers for land conversion. Studies on the economic valuation of land conversion in different regions reveal:

- » Approximately 4.43 gigatonnes of carbon are sequestered in Canada's national parks. If society had to replace this stored carbon, it would cost between US\$ 11 billion and US\$



2.2 trillion depending upon society's valuation of the carbon sequestration function.

- » The value of Uganda's protected areas as a carbon sink is estimated at US\$ 20.3 million annually.
- » Mexico's federal and state protected areas store 2,446 MtCO₂, equivalent to 5.6 years of Mexico's CO₂ emissions at the 2004-year rate. The value of Mexico's protected areas as a carbon sink is estimated at US\$ 12.2 billion.

Protected areas can also provide additional insurance against the predicted instability of agriculture and fisheries. A changing climate will increase stress on both new and traditional crop varieties. Protected areas are one response to this loss of agricultural biodiversity and an increasing number are being designed to protect sources of crop genetic material. In Pisac Cusco, Peru, seven Quechua communities are establishing a "Potato Park" to safeguard wild relatives of potato.



“ Approximately 20-25% of global greenhouse gas emissions result from the conversion of forests and other ecosystems.



Well-managed protected areas support healthy ecosystems that in turn support healthy people. When ecosystem health declines, one consequence is increased disease risk for vulnerable people. There are many links between human and wildlife health and ecosystem health. Forest clearings create “edges,” where the interactions among pathogens, vectors and hosts are increased. They also concentrate wildlife populations into smaller patches of habitat, and increase the odds that these animals get in contact with humans and domestic animals. This in turn increases the number of pathogens and parasites jumping from wildlife to people (or their livestock), and/or vice versa. There is now evidence that forest clearing has increased the spread of diseases such as malaria, leishmaniasis, avian flu, Ebola and SARS.



The 32,000 ha Ruteng Park on the island of Flores in Indonesia protects a critical watershed in the region, for its towns and farms. The park provides timber, fuel wood, clean water and a variety of forest products of regional value. Researchers working with Conservation International’s Center for Applied Biodiversity Science found that in communities living near the protected area, there were fewer illnesses from malaria and dysentery, children missed less school because of improved health, and less hunger was associated with crop failure than in communities without intact forests nearby. Villages within the vicinity of intact forest cover also had improved water quality. These benefits of healthy forests within protected areas are not widely known.

Researchers created an economic model of the Amazonian Brazilian economy to examine how investments in conservation such as protected areas would provide quantifiable economic benefits in the form of improved human health. Findings show that the expected costs of new Amazonian protected areas, measured in reduced forestry and agricultural production, are offset by expected benefits in reduced disease incidence. This demonstrates how large-scale investments in conservation also support economic growth by improving human health.

THEME 3

Protected Areas and Human Health

Medicinal plants and better health outcomes



Medicinal plants continue to be an important therapeutic aid for alleviating ailments of humankind. Protected areas are important repositories for medicinal plants, traditional medicines and traditional knowledge, and offer prospects of discovering new drugs.

Local people in the Dolpa district of Nepal depend on over 400 plant species collected from the Shey Phoksundo National Park for traditional health care.

Local communities in Cameroon set up a “Prunus Harvesters Union” to collect bark of the *Prunus africana* (used in drugs for the treatment of prostate cancer) on the slopes of Mount Cameroon National Park, and tripled their profits in the first year.



In recent decades, protected areas yielded valuable commercial drug discoveries such as cyclosporine and Taq polymerase. Cyclosporine, which was discovered from a soil sample taken from Hardangervidda National Park in Norway in 1969, was the 33rd top-selling drug worldwide in 2000, with total sales of US\$ 1.2 billion. Taq polymerase, which was isolated from bacteria discovered in the natural hot springs of the Yellowstone National Park in 1966, has been used in a range of biotechnological applications, with annual sales exceeding US\$ 200 million.



THEME 4

Marine Protected Areas

Increasing Fish Stocks and Livelihood Security of Coastal Communities

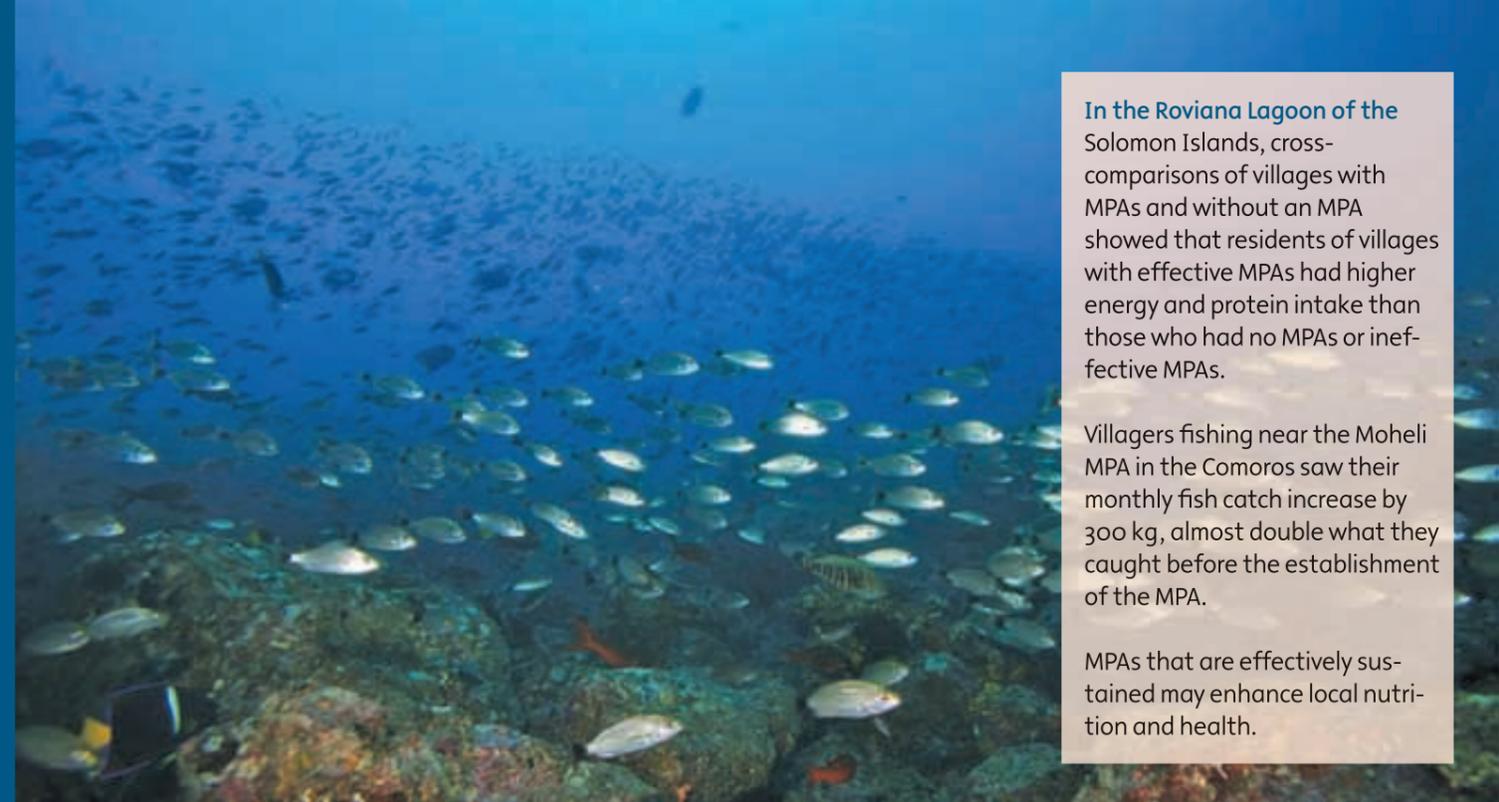
From the Indian Ocean to the Pacific, Atlantic and Arctic Oceans, fish stocks are declining all over the world. Over-exploitation of marine and coastal resources and unwise fishery management adversely impact marine life and erode the traditional basis of life for millions of people, by depriving communities of their main source of vital protein and by increasing poverty. Recent research has shown that Marine Protected Areas (MPAs) can contribute to the conservation of ocean species and habitat, and aid in the development of sustainable fisheries.

MPAs protect exploited species during critical stages of their life and act as insurance against poor and inadequate fishery management. They protect sedentary species such as shellfish, reef fish and rockfish. They can also help protect migratory species such as salmon and cod through protection of key spawning, rearing grounds and migration corridors. MPAs have been shown to increase the average size of organisms, as well as their density within their boundaries. They enhance the fish populations outside of the reserve by spillover into adjacent areas. Yet, only a mere 0.5% of the oceans are protected through MPAs against 12% of the terrestrial lands, and marine waters beyond national jurisdiction have nearly no MPA to support deep-sea fisheries and the “global marine commons.”

The implementation of MPAs for fisheries management has increased recently due to the role of MPAs in conserving biodiversity, increasing fish stocks and enhancing the food security of coastal communities.

Recent studies undertaken by The Nature Conservancy and the WWF have revealed that MPAs can lead to:

- » **Improved fish catches and bigger fish:** MPAs facilitate “spilling over” of fish from no-fishing zones to adjacent areas, improve fish catches, and contribute greatly to poverty reduction. In Navakavu MPA in Fiji, average monthly household income (US\$ 251) in January 2007 was more than double that of a non-MPA household (US\$ 118). Since its establishment in 1995, the Apo Island MPA in the Philippines facilitated a tenfold increase in fish catch in surrounding areas. In Fiji, a locally managed MPA network has tripled fish catches and increased local income by 35% over three years.
- » **New jobs:** The MPA’s greatest boost to household incomes comes from new jobs, especially in tourism. In Bunaken MPA, Indonesia, the tourist industry provided new occupation to local villagers, and those who switched to a new occupation earn approximately twice as much as fishers (US\$ 114 versus US\$ 44 a month).
- » **Better local governance:** MPAs need involvement of local communities just as local communities need MPAs. In many MPAs, community-based, participatory governance mechanisms have evolved throughout the process of designating and managing MPAs. This has facilitated a more united



In the Roviana Lagoon of the Solomon Islands, cross-comparisons of villages with MPAs and without an MPA showed that residents of villages with effective MPAs had higher energy and protein intake than those who had no MPAs or ineffective MPAs.

Villagers fishing near the Moheli MPA in the Comoros saw their monthly fish catch increase by 300 kg, almost double what they caught before the establishment of the MPA.

MPAs that are effectively sustained may enhance local nutrition and health.

and responsible voice for the communities, oriented the MPAs towards community needs, and reduced conflict both within the communities and with neighbouring communities.

- » **Benefits to public health:** Greater fish catches have led to greater protein intake and an improvement in children’s health in many fishing communities associated with MPAs. For example, visitor entry fees to Bunaken MPA, Indonesia, have funded water-supply tanks, public toilets and washing places in several villages, thus improving public health.

- » **Benefits to women:** MPAs help empower women economically and, in some cases, socially. In Navakavu MPA in Fiji, women are the reef gleaners and benefit financially by collecting and selling the bountiful shellfish from just outside the marine protected area. In Bunaken (Indonesia) and Apo Islands, diving tourism created more high-income job opportunities for women, improving their lives. In the Arnavons MPA (Solomon Islands), women gained a stronger voice in community meetings when they became involved in the income earning activities of seaweed farming and traditional clothes making.

“The marine protected area is like a bank to the people. There has been an increase in fish stock, restoration of corals, and a great comeback of marine life.”

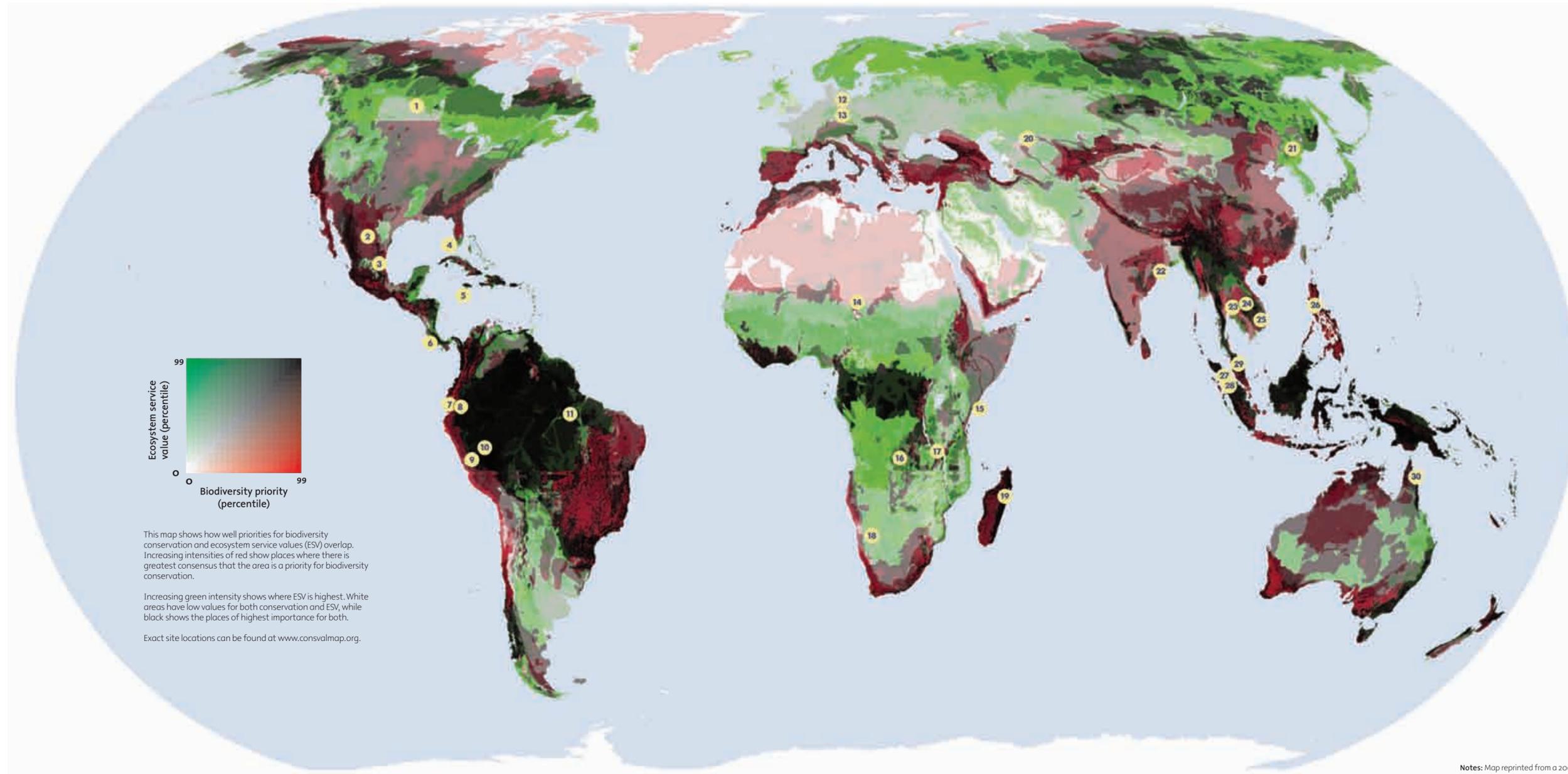
Fijian community leader



MPAs can benefit local people by creating new opportunities to gain income. Countries with coral reefs attract a large number of snorkelers and scuba divers every year, yielding significant benefits to the host country. Globally, almost US\$ 10 billion is spent on coral reef tourism every year. Potential fishing benefits from healthy coral reefs are estimated at US\$ 5.7 billion annually.

Nature's Value for Livelihoods and Development Cases and Places

- Canada**—Direct spending for tourism to Parks Canada sites generates CDN \$1.5 billion annually to the Canadian economy, which is five times the government expenditure (2005).
- Mexico**—A government study found that 5.5 million tourists visited federally protected areas, with direct expenditures close to \$285.7 million. But another 2007 study put visitation at 14 million visits per year, with tourists spending \$660 million, or 5.5% of international traveler expenditures to all of Mexico.
- Mexico**—The 45,000 residents of the municipality of Coatepec voluntarily donated \$9,000 in 2001 to pay owners of well-preserved forests in exchange for the conservation and watershed value of forest services.
- USA**—In 2000–2001, the Florida Keys National Marine Sanctuary generated \$140 million in income for the county and supported almost 10,000 full and part-time jobs—with multiplier effects, the value was over \$504 million.
- Jamaica**—A 2005 study valued the ecosystem services at the Portland Bight Marine Protected Area between \$41–\$53 million over 25 years—much higher than the \$19 million in costs.
- Costa Rica**—The Terraba-Sierpe wetlands and fisheries provide fish and shellfish worth \$6 million to local families through fishing, tourism, and related activities, according to a 2004 study.
- Ecuador**—Ninety percent of Quito's drinking water comes from the Condor Biosphere Reserve. A new fund provides close to \$2 million for watershed services, forest protection, and compensation to 27,000 reserve residents (2005).
- Ecuador**—Tourism to Cuyabeno Wildlife Reserve generated around \$2.8 million based on a 2001 study. Of this, \$2,433,203 went to tour companies, \$245,480 to indigenous communities, and \$132,856 to the Environment Ministry.
- Peru**—A 2007 analysis of Peru's entire protected area system, which covers 14% of the country, found that current and potential benefits contribute over \$1 billion per year to the national economy, compared with the \$1.7 million allocated for park management. Every dollar invested in tourism to protected areas returned \$146.
- Peru**—Malaria mosquitoes follow road development, logging, and deforestation, and a 2006 study found that in the Peruvian Amazon, people are bitten by malaria-carrying mosquitoes at a rate 278 times greater than in intact forest areas.
- Brazil**—Four forest management reserves totaling 40,000-km² designated in 2006 for sustainable timber extraction in areas bordering the Santarém-Cuiabá highway are expected to generate \$100 million in annual gross revenue from timber, and 8,600 jobs.
- Germany**—Peat bogs in Müritzer National Park were drained for agriculture from 1980–2000. By 2000, this wetland became drought-prone, with groundwater tables falling by 1.5 meters, soil erosion, release of high levels of CO₂, eutrophication, and low agricultural output.
- Danube River Basin**—Flooding in 2006 displaced up to 30,000 people and damages were estimated at over half a billion Euros. The cost to restore four areas, which would mitigate such flooding, is € 19,784,000 (an average of € 500 per ha/year) and generate additional socio-economic and ecological benefits valued at € 49,460,000.
- Cameroon**—The Waza Logone floodplain is nearly destroyed, crippling water supply to agriculture and increasing poverty. Restoration would cost \$10 million and be recovered in less than five years, as reported in 2004.
- Kenya**—Kisite Marine National Park and Mpunguti Marine National Reserve are fish raising factories, providing nearly 29 tons or \$34,000 to local populations (2001).
- Zambia**—The Barotse floodplain and wetlands complex—one of the largest in the Zambezi Basin—provides products worth over \$12 million annually to 250,000 local people (\$400 per household per year), and another \$40 million at regional levels.



- Zambia**—South Luangwa National Park costs \$1.2 million, but generates \$4.1 million in tourism and creates 1,200 direct jobs and another 1,200 indirect jobs, and with multiplier effects, generates \$16 million (2004).
- Namibia**—Tourism in protected areas underpins national tourism and raises \$204–\$364 million in total income: 20% goes directly to the poor. This 2005 study also found that community-managed conservation areas generated 547 full-time and 3,250 part-time jobs (mostly women) and provided \$2.5 million in benefits from game-meat.
- Madagascar**—Mantadia National Park provides \$126,700 per year in watershed protection and natural hazard mitigation (2002).
- Kazakhstan**—The Aral Sea is shrinking with devastating consequences: a 2005 study found annual losses of \$64 million to agriculture, \$15 million to tourism, \$58 million to industry, and social impacts of \$22 million. Restoring the sea is cost-effective compared to these losses.
- China**—Changbaishan Mountain Biosphere Reserve provides multiple ecological services worth \$62 million annually; a 2001 study found that these ecological services are ten times higher than revenue that logging would generate.
- India**—A 2005 study found that a village protected by the Bhitarkanika mangrove ecosystem had much less damage from a 1999 cyclone than nearby villages, recording an average loss of \$33 per household, whereas villages without mangroves lost \$154 per household in one case, and \$44 per household in another.
- Cambodia**—Without logging, the 27,000 residents of Ream National Park sustainably collect forest products worth 6% of each person's income (2003).
- Cambodia**—The Stoeng Treng wetlands, a Ramsar site, provide Veun Sean village with \$3,200 per household per year. Fisheries provide most of the area's annual income: 56% for all households and 77% for poor families, based on a 2005 report.
- Vietnam**—The Hon Mun Islands Marine Protected Area generates \$17.9 million each year in recreational value, but it is threatened by a port expansion that would generate only \$3.1 million.
- Philippines**—A 2006 report found that after strong enforcement of laws against illegal fishing in Mabini Marine Protected Area, local people saw their average daily fish catch jump from 2 to 8 kgs. per day.
- Indonesia**—Lore Lindu National Park provides water benefits worth \$6.1 million annually for 304,607 local residents who irrigate 22,338 hectares of crops. A 2005 study found that, including benefits to industry and other users, this water value increases to \$9 million total, and an additional \$1.7 million value of local fishing.
- Indonesia**—A 2005 study looked at the value of conserving the Leuser Ecosystem over a 30-year period, from 2000–2030. Conservation provided \$22.2 billion in value, compared to logging and farming the area, which would only yield \$16.9 billion in value.
- Malaysia**—With fish catches averaging 1.3–8.8 kg an hour, a 400-km² managed mangrove forest in Matang supports a fishery worth \$100 million a year; this 2001 study reports that each square kilometer of mangrove is worth about \$250,000 per year in fishery value alone.
- Australia**—A 2004 study found that the total value of ecosystem goods and services for the 9,000-km² Wet Tropics World Heritage Area is between \$145–163 million a year, or \$16,000–18,000 per km².

Hundreds of additional cases can be found at www.consvalmap.org.

Notes: Map reprinted from a 2007 *BioScience* article, "Global conservation of biodiversity and ecosystem services," by W.R. Turner, K. Brandon, T.M. Brooks, R. Costanza, G.A.B. da Fonseca, and R. Portela. (*BioScience* 57: 868–873).

All figures in USD\$ unless otherwise noted.

References can be found at www.consvalmap.org.



Protected watersheds demonstrate clear and direct links between human welfare, ecological services and conservation. When protected areas include watersheds, they have an evident value by providing fresh water for irrigation and downstream water supply.

A World Bank study of all Madagascar's parks showed that protected areas provided 875,000 rural rice-farming households with water — a benefit worth US\$ 54 to US\$ 119 million. Mantadia National Park in Madagascar alone provides more than US\$ 125,000 annually in watershed protection and natural hazard reduction. A study of Lore Lindu National Park, another park in Indonesia, found that it provides US\$ 6.1 million annually for 304,607 people who depend on water that irrigates 22,338 ha of crops. It also provides fish worth US\$ 1.7 million to local residents. When values to industry and other users are included, the park's water-related benefits are valued at US\$ 9 million.



Many important national parks and other wildlife reserves have value in protecting watersheds that provide drinking water to towns and cities. In some cases, the area was originally protected for scenic or wildlife values, and its watershed benefits were only recognised later. One example of this is the iconic Yosemite National Park in California, USA, which helps to supply high quality water to San Francisco. Conversely, sometimes the water values have been recognised from the beginning and watershed protection has been the major reason for protecting a forest. For example, the water supply company of Melbourne, Australia has deliberately protected forests, in order to maintain high quality water for residents: 90% of Melbourne's water comes from forested catchments. For other cities, watershed protection has bought critical time for biodiversity by protecting remnant natural areas that would otherwise have disappeared—only later have the conservation values been appreciated. This is the case in Singapore, where the Bukit Timah National Park was initially protected to maintain urban water supplies but is now recognised as both an important haven for wildlife and the only remaining natural forest on Singapore Island.

Around 2.7 million people in Peru use water that originates from 16 protected areas with an estimated value of US\$ 81 million. The rivers in these protected areas also contribute to 60% of Peru's hydroelectricity generation, with an estimated



value of 320 million. In the last 10 years, Peru's protected areas also provided savings of US\$ 5 million by protecting dams and reservoirs from sedimentation.

The fresh water needs of 19 million people or 83% of Venezuela's urban population comes from 18 national parks. About 20% of the country's irrigated lands depend on protected areas for their irrigation water.



About 80% of Quito's population of 1.5 million people receive drinking water from two protected areas; Antisana (120,000 ha) and Cayambe-Coca Ecological Reserve (403,103 ha). Fourteen protected areas and the Atlantic Rainforest Biosphere Reserve help to protect water sources for Rio de Janeiro.

Many of the world's largest cities rely on drinking water from protected areas. A survey carried out for WWF and the World Bank in 2003 found that around a third (33 out of 105) of the world's largest cities obtain a significant proportion of their drinking water directly from protected areas. At least five other cities obtain water from sources that originate in distant watersheds that also include protected areas. At least eight more cities obtain water from forests where management priorities include water supply.

- » **Abidjan, Cote d'Ivoire:** Banco National Park
- » **Barcelona, Spain:** Sierra del Cadí-Moixeró and Paraje Natural de Pedraforca
- » **Belo Horizonte, Brazil:** Eight separate protected areas
- » **Bogotá, Colombia:** Chingaza National Park
- » **Brasília, Brazil:** Brasilia National Park
- » **Cali, Colombia:** Farallones de Cali National Park
- » **Cape Town, South Africa:** Cape Peninsula National Park and Hottentots Holland Nature Reserve
- » **Caracas, Venezuela:** Three national parks
- » **Dares Salaam, United Republic of Tanzania:** At least four protected areas
- » **Durban, South Africa:** Ukhahlamba-Drakensberg Park
- » **Harare, Zimbabwe:** At least three protected areas
- » **Ibadan, Nigeria:** Olokemeji and Gambari Forest Reserves
- » **Jakarta, Indonesia:** Gunung Gede Pangrango and Gunung Halimun
- » **Johannesburg, South Africa:** Maluti/Drakensberg National Park and Ukhahlamba-Drakensberg Park
- » **Karachi, Pakistan:** At least six separate protected areas
- » **Los Angeles, USA:** Angeles National Forest
- » **Madrid, Spain:** Peñalara Natural Park and Cuenca Alta del Manzanares Regional Park
- » **Maracaibo, Venezuela:** Perijá National Park
- » **Medellín, Colombia:** Alto de San Miguel Recreational Park and Wildlife Refuge
- » **Melbourne, Australia:** Kinglake, Yarra Ranges and Baw Baw National Parks
- » **Mumbai, India:** Sanjay Gandhi National Park
- » **Nairobi, Kenya:** Aberdares National Park
- » **New York, USA:** Catskill State Park
- » **Perth, Australia:** Yanchep National Park
- » **Rio de Janeiro, Brazil:** Five protected areas near the city and 15 further away protecting the catchment
- » **Salvador, Brazil:** Lago de Pedra do Cavalo and Joanes/Ipitinga Environmental Protection Areas
- » **São Paulo, Brazil:** At least six protected areas
- » **Santo Domingo, Dominican Republic:** At least six protected areas
- » **Singapore:** Bukit Timah and the Central Catchment Area
- » **Sofija, Bulgaria:** Rila and Vitosha National Parks and a biosphere reserve
- » **Sydney, Australia:** Four protected areas
- » **Tokyo, Japan:** Nikko National Park and Chichibu-Tama National Park
- » **Vienna, Austria:** Donau-Auen National Park

THEME 5

Protected Areas and Fresh Water

Irrigation and Downstream Water Supply

THEME 6

Protected Areas and Food Security

Crop Wild Relatives

Plant genetic resources are invaluable for present and future generations. Their importance is more pronounced now given the reality of climate change, since more extreme adaptation in agricultural crops is necessary. There is therefore a need for fresh genetic material that is resilient or has wider tolerance as changing conditions increase. Wild relatives of globally important crops such as barley, maize, oats, potatoes, rice and wheat are becoming more productive. Many examples highlight the importance of conserving crop wild relatives as sources of novel traits for resistance to disease and drought, and tolerance to extreme temperatures and salinity.

Protected areas hold important plant genetic resources for food and agriculture, including endemic and threatened crop wild relatives and land races for food production. Many successful examples of plant agrobiodiversity conservation in protected areas already exist around the world, both in conventional protected areas that contain crop wild relatives and in specially designed on-farm areas tailored to the conservation of traditional land races.



Armenia: The Erebuni State Reserve, 89 ha, is known for its diversity of wild wheat, including *Triticum urartu*, *T. boeoticum*, *T. araraticum* and *Aegilops spp.*

Australia: Several species of economic importance occur in the Border Ranges National Park, 31,683 ha, including macadamia nuts (*Macadamia integrifolia* and *M. tetraphylla*) and finger lime (*Microcitrus australasica*), which has been used as a source of genetic material to improve disease resistance in commercial citrus fruit.

Costa Rica: Corcovado National Park, a 47,563 ha park in the south of the country, is a genetic reserve for avocado (*Persea americana*), nance (*Byrsonima crassifolia*) and sonzapote (*Licania platypus*).

Germany: The 374,432 ha Flusslandschaft Elbe Biosphere Reserve (includes the Steckby-Lödderitzer Forest Nature Re-



- » **Wheat:** A wild relative of wheat, *Triticum turgidum var dicoccoides*, from the Eastern Mediterranean was used to increase the protein content of bread and durum wheat.
- » **Rice:** During the 1970s, when grassy-stunt virus severely reduced rice yields in Asia, disease resistance genes found in a population of *Oryza nivara* growing wild in Uttar Pradesh, India, saved the rice crop.
- » **Tomato:** An increase of 0.1% in the solid content of this fruit is worth

- around US\$ 10 million a year to processors in California. One wild living tomato has allowed plant breeders to boost, by 2.4% or \$250 million annually, the level of solids in commercial varieties.
- » **Potato:** Genes from wild Mexican *Solanum demissum* saved the world from potato blight by developing a blight resistant commercial variety.
- » **Peanuts:** Three different wild peanuts have been used to breed commercial varieties resistant to

- root knot nematodes, helping to save peanut growers around the world an estimated \$100 million a year.
- » **Broccoli:** By crossing cultivated broccoli with a wild Sicilian relative, scientists are breeding a variety that contains higher levels of the cancer fighting chemical, sulforaphane, an anti-oxidant that destroys compounds that can damage DNA. The new variety of broccoli contains 100 times more sulforaphane.

It contains wild fruit tree species such as pear (*P. achras* and *P. pyraster*) and apple (*M. sylvestris*). The Steckby-Lödderitzer Forest, part of the reserve, is particularly important for in situ conservation of wild fruit crop genetic resources. Other important crop wild relatives include perennial pasture ryegrass (*Lolium perenne*).

Iran: Touran protected area (1,102,080 ha) comprises a national park and a biosphere reserve containing wild relatives of barley (*Hordeum sp.*).

Kyrgyzstan: The walnut-fruit (*Juglans regia*) forests of the 63,200 ha Besh-Aral State Nature Reserve, contain a range of species including pear and wild plum (*P. sogdiana*).

Peru: Quechua communities in the Pisac Cusco area of Peru (an area characterised by rain-fed high altitude agriculture systems) have established a “Parque de la Papa” (Potato Park), a community-based, agrobiodiversity-focused conservation area. The 8,000 villagers from six surrounding communities have agreed to manage jointly their 8,661 ha of communal land for their collective benefit, thereby conserving their landscape, livelihoods and way of life, and revitalizing their customary laws and institutions.

Turkey: The Beydaglari Coast National Park (34,425 ha), situated in Western Anatolia on the southern Mediterranean coast of Turkey (also known as Olimpos-Beydaglari) contains the rare endemic relative of the faba bean (*Vicia eristalioides*).

United States: Organ Pipe Cactus National Monument (133,925 ha) is located in Southwestern Arizona, sharing a southern boundary with Mexico and protecting small populations of wild chili peppers (*Capsicum annuum*).



“ Protected areas hold important plant genetic resources for food and agriculture, including endemic and threatened crop wild relatives and land races for food production.”



THEME 7

Protected Areas and Natural Disaster Mitigation

Reducing Vulnerability of Communities

Protected areas maintain healthy intact ecosystems, which are more robust, mitigating impacts of disasters and restoring destroyed or degraded areas. There is a clear need to invest in the environmental capital of natural resources whether forests, savannahs, mangroves or coral reefs. Such investments can reduce ecosystem vulnerability and lessen the impact of disasters.

Climate change increases the rate, the reach and the intensity of natural hazards. Yet recent scientific studies are confirming what many people suspected and what makes intuitive sense: intact or healthy ecosystems mitigate the effects of natural hazards and reduce vulnerability to these hazards. Protected areas therefore play an important role in reducing vulnerability of communities to disasters, reducing their physical exposure to natural hazards and providing them with livelihood resources to withstand and recover from crises.



Throughout the tropics, coral reefs, mangroves, lowland forests, barrier islands and wetlands buffer the inhabitants and the biodiversity of coastal areas from potentially dangerous waves, storm surges, tropical cyclones, mudslides and flooding caused by storms and by geological activity. Reducing vulnerability to hazards is just one of the many benefits that protected areas can provide.

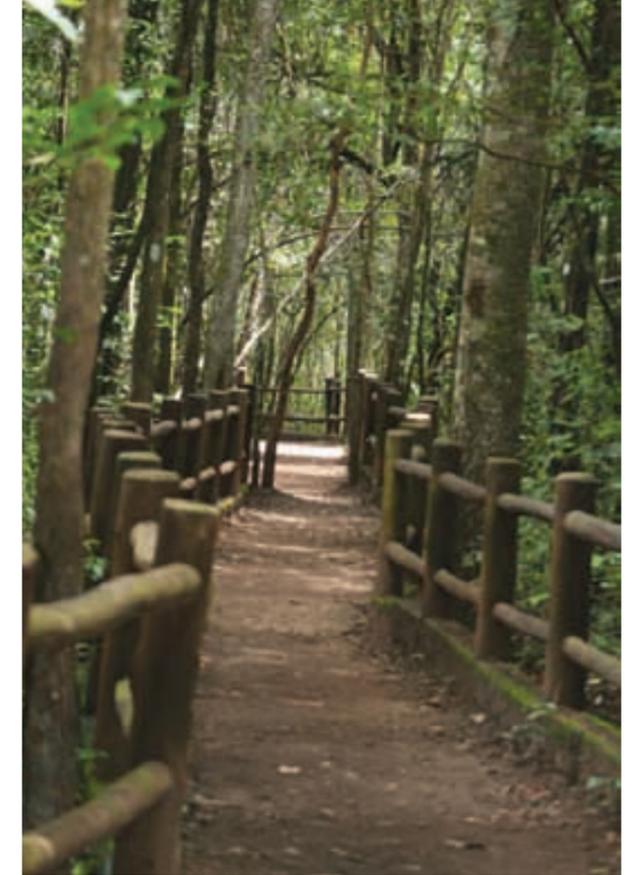
Research can help identify places where degradation of ecosystems increase their vulnerability—as well as places where protecting or restoring these ecosystems can mitigate the effects of hazards on people and economies:

- » Villages with healthy mangroves, coral reefs and lowland forests were better protected from the 2004 Asian tsunami in India, Sri Lanka, Malaysia and Indonesia.
- » Protected Mangrove areas in Indonesia contribute US\$ 600 per household annually in terms of erosion control.
- » Protection of forest watersheds above Malaga in Spain controlled flooding in the region that had been recorded over regular intervals over a long period.

“ Protected areas play an important role in reducing vulnerability of communities to disasters, reducing their physical exposure to natural hazards and providing them with livelihood resources to withstand and recover from crises.

- » Protected coral reef ecosystems contribute the equivalent of US\$ 9 billion per year in coastal protection around the world.
- » Trees and woody species in protected areas are important components of drought mitigation systems in dry lands.
- » Studies showed that the Ruteng National Park in Indonesia provides a drought mitigation service, a latent and unrecognized ecosystem service, to local people.

Maintaining healthy ecosystems is a relatively inexpensive way to prevent loss of life and protect property and infrastructure, while also providing many other benefits.



Illegal logging on the Indonesian island of Sumatra, which lies in the Sundaland Hotspot, resulted in upland deforestation that led to a massive flash flood, killing more than 200 people. Reaction was swift: communities in the flooded region and local government representatives worked together to gain support for a local decree in order to establish the Batang Gadis National Park. This 266,760-acre protected area is a model for a “bottom-up” approach to creating a national park that will mitigate the impacts of natural hazards.

THEME 8

Protected Areas and Tourism

Economic Benefits and Poverty Reduction

Travel and tourism is one of the world's largest economic activities. International tourism grew by 10% in 2004 to reach a record high of more than 764 million arrivals and receipts increasing by 9.2% to US\$ 633 billion. This growth is in part driven by growing interest in ecotourism and by the increasing numbers of visitors to protected areas. For example, Galapagos National Park and Marine Reserve exceeded 140,000 visitors in 2006 up over 100% in the past decade. Bolivia's Eduardo Avaroa Reserve has seen an increase from 8,000 visitors in 1999 to over 60,000 in 2005.

Additionally, market surveys have shown that 42% of European travelers surveyed in 2000 included a visit to natural parks as part of their vacation activities. In Costa Rica 72% of tourists visit a national park. Protected area management budgets have not increased proportionally to the growing number of visitors. As a consequence, tourism is increasingly becoming a threat to conservation objectives. However, the potential for park tourism to generate significant revenue flows, both for conservation and for sustainable economic development and poverty reduction, is enormous. In fact, tourism revenues have become an essential part of the operating budget for many protected areas, through a number of relatively simple, market-based mechanisms including entrance and other user fees or concessions and licenses.



If the threshold of sustainability can be established for tourism in parks or if sufficient tourism revenue can be reinvested to mitigate negative impacts and generate benefits for local and indigenous communities, then a virtual cycle can be established that will increase conservation revenues, economic development and political support for parks.

- » Park tourism brings business opportunities, jobs and livelihood alternatives to local and surrounding communities, increasing real estate value, aggregating value to local products and brands, and emphasizing the political and social importance of conservation. New economic measurement tools that take these benefits into consideration have brought some important facts to light:
- » Park tourism provided 207 million Australian dollars in 2005 to the Southern Forest and Gascoyne Coast Region. Economic studies showed that 15% of this amount would not have been spent if the parks did not exist.



Most major tourism destinations (even urban ones) include one or more protected areas in their key attractions. Tourists will stay longer, and spend more, when they can visit and enjoy the protected area linked to destinations. Visits to parks are an integral part of the core tourism packages sold in many areas. For example:

- » **Sharm El Sheik, Egypt**—Ras Muhammad National Park
- » **Cancun, Mexico**—Sian Ka'an Biosphere Reserve
- » **San Jose, Costa Rica**—Braulio Carillo National Park
- » **Rio de Janeiro, Brazil**—Tijuca National Park
- » **Cuzco, Peru**—Machu Picchu National Park
- » **Cozumel, Mexico**—Cozumel National Park
- » **Iguassu Falls**—Cataratas Binational Park (Brazil and Argentina)
- » **Vienna, Austria**—Wienerwald NP

- » Between 2003 and 2005, in New Zealand, tourism specifically targeted to four protected areas (West Coast, Abel Tasman National Park, Queen Charlotte Track, and Fiordland National Park) generated four thousand jobs, up to 15% of total jobs in the areas, 130 million New Zealand dollars in direct household income, and a total tourism revenue of 560 million dollars.
- » In fiscal year 2000-2001, Parks Canada had gross tourism revenues of Canadian \$84.7 million, a 111% increase since 1994-1995. Three sources of income were prominent: entry fees (CA\$ 30.1 million), rentals and concessions (CA\$ 14.3 million) and camping fees (CA\$ 10.9 million). The total annual budget of Parks Canada in 2006 was CA\$ 50.4 million, with a 98% return due to tourism revenues.
- » Federal protected areas in Mexico currently receive around 14 million domestic and international tourists, with a total spending of US\$ 660 million per year.
- » Parque Nacional Morrocoy in Venezuela receives an annual average of 1.5 million visitors. In 2001 the park received
- » 1.15 million visitors with an average expenditure of US\$ 135 per visitor and created 5,000 permanent jobs (approximately 50% of the local employment) in areas adjacent

- to the park.
- » The Tortuguero National Park in Costa Rica generated 350 jobs and each local tour guide earns on average US\$ 1,755 to 3,510 during a five-month tourist season.
- » The Kakum National Park in Ghana attracted 90,000 visitors in 2005 and facilitated in creating 5,000 tourism related jobs in the region around the park.
- » Cousin Island Special Marine Reserve and Praslin National Park in Seychelles generated US\$ 600,000 through direct and indirect revenues.
- » In 2006, 27% of South Africa's 8.4 million international visitors declared that they came to enjoy natural attractions and wildlife, increasing to 60% when only leisure tourists are considered. A business-oriented state corporation, South African National Parks (SANParks), was set up to manage 21 National Parks and in 2006 SANParks recovered 75% of its costs through tourism revenues. SANParks concessions include 12 lodges, 19 shops, 17 restaurants, and four picnic sites for private partners. Thanks largely to the resources and political visibility generated by tourism; SANParks has increased its managed protected areas by 10% (360,000 ha) over the past 10 years.

Due to the direct value of protected areas to resort and hotel owners, several of them have either established private reserves as part of their property and attractions, or led processes to establish adjacent public parks. In Costa Rica, a network of over 110 Private Reserves totaling more than 60,000 ha is largely financed through tourism. Other notable examples include:

- The Dominican Republic's 350 room Punta Cana Resort created and supports a 1,500 acre reserve.
- Cayman Ecological Refuge is 5,600 ha private reserve in Brazil's Pantanal region, which is one hotels main attraction.
- The development of El Nido Resorts in Palawan, the Philippines, led to the creation of the 90,000 ha El Nido-Taytay Managed Resource Protected Area, and the resort-supported El Nido Foundation, which is implementing environmental and social projects.
- In the Brazilian South-western Amazon, the success of the Cristalino Jungle Lodge and its scientific program ultimately led to the establishment of the 186,000 ha Cristalino State Park.

Protected Areas and Cultural Values

Spiritual and Sacred Sites

Spiritual and cultural values are the intangible benefits of protected areas. They are difficult to quantify in economic terms. In so many ways and in so many places, sacred sites, beliefs, faith groups and protected areas meet, from the water sources inhabited by ancestor spirits of Madagascar's parks and reserves to the Christian monasteries in Romania's protected areas, from the pilgrimage routes walked by millions of Hindus and Buddhists in India and Nepal to the mountains, holy for Jews, Christians and Muslims alike. Protected areas also help to bring back and sustain long held cultural traditions such as local taboos, or hunting and harvesting seasons result in temporary closures of certain areas (e.g. in many Locally Managed Marine Areas in the Pacific). Protected areas also provide sanctuary for culturally important species (e.g. Dugong, turtles, etc.), protecting and managing populations so that they can be harvested for specific cultural events. Some examples of sacred sites in existing protected areas and their spiritual interactions include:



- » **Mount Kailash, in Parsa Wildlife reserve in the autonomous region of Tibet** is an important pilgrimage site for followers of many faiths, including Buddhism, Bön, Jainism, and Hinduism. Most pilgrims walk a holy "kora," or circuit of the mountain (a distance of 56 kilometres which ascends to over 5,700 metres above sea level).
- » **Gunung Mutis Nature Reserve in West Timor and Indonesia** is important to the Meto indigenous people, whose spiritual relationship with nature is of great significance to daily life. Rituals are centred on ancestor worship.
- » **Jirisan National Park in South Korea** houses eight Buddhist temples and many cultural treasures (e.g. Gakhwangjeon, a three-story stone pagoda propping up four lions, and the remarkable Gakhwhangjjeon seokdeung, one of the largest existing stone lights).
- » **Shivapuri National Park in Nepal** is spiritually significant for the popular shrines and meditation centres for Hindus and Buddhists nestled in the natural surroundings. The Bud-

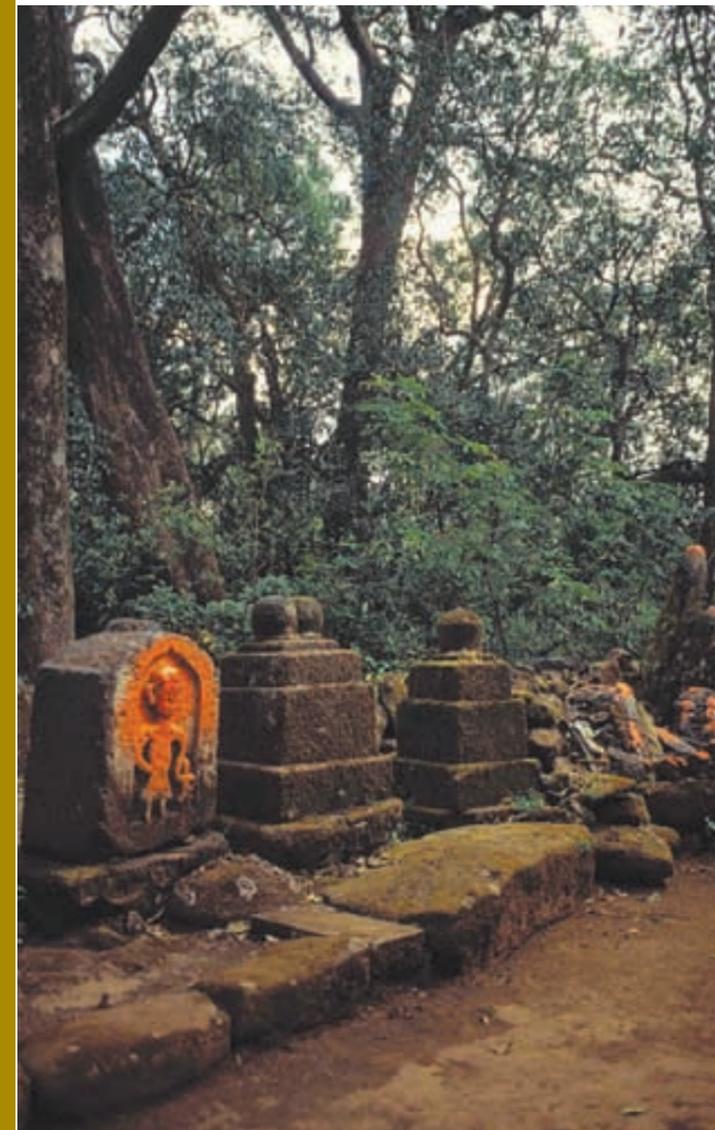


hanilkantha and Sundarimai shrines and the Nagi monastery attract thousands of pilgrims during festive seasons.

- » **Argentina's Lanin National Park**, its Mapuche Indian name meaning "dead rock," is famous for its monkey-puzzle tree (*Araucaria araucana*), which is sacred to the Mapuche Indians, or the "Earth people."
- » **RB-EB del Beni (Beni Biosphere Reserve and Biological Station), Bolivia** is home to the "Chimane," an ethnic

group who keep and practice their ancestral rites and customs.

- » **Muntanya de Montserrat National Park, Spain**, is nestled in the rocky mountain Montserrat near Barcelona, in Catalonia. It harbours 12 hermitages and two Catholic monasteries, one of which is devoted to the Holy Virgin Mary and has been a pilgrimage centre since the 14th century. Because of its many spiritual, cultural and natural values, Montserrat has become an outstanding identity symbol of Catalonia.
- » **Boabeng Fiema-Monkey Sanctuary, Ghana**, is considered as a sacred grove because it supports populations of black and white Colobus monkey (*Colobus vellerosus*) and Mona monkey (*Cercopithecus mona*), both of which are revered and strictly protected as sons of the gods of the people of Boabeng and Fiema villages.



Sacred sites also support high biodiversity values, holding considerable potential to support conservation efforts through developing "people-inclusive" protected area management objectives. Because of their unique intercultural and interdisciplinary character they can be a suitable means for environmental education, cross-cultural learning and intergenerational transmission of spiritual and bio-cultural knowledge. The sacred and spiritual dimensions of protected areas reiterate their role in upholding cultural and spiritual values that, like biodiversity, are at risk of external pressures and threats.

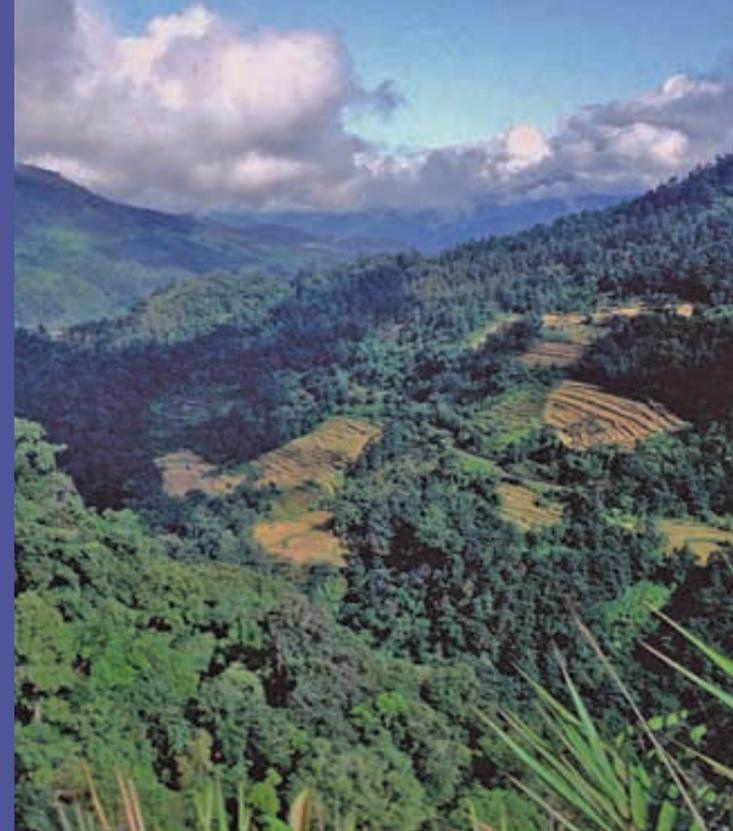


Enhancing Benefits of Protected Areas

People, Participatory Decision-Making and Management, Good Governance

The ecological, economic and social benefits of protected areas can only be enhanced and sustained when they are effectively managed through good governance. Participatory decision-making and management processes that incorporate and respond to the rights and interests of a broader range of stakeholders—particularly the indigenous and local communities living in and around protected areas—are essential ingredients of good governance. Participatory and equitable conservation, with involvement of indigenous and local communities, can enhance net benefits for both conservation and people. Collaboratively Managed Protected Areas and Community Conserved Areas are the two broad categories of participatory conservation that incorporate several principles of good governance. There are now many documented examples of these areas around the world:

- » **The Kaa-Iya del Gran Chaco National Park**, Bolivia's largest protected area set up in 1995, has three indigenous peoples, the Iyoseño Guaraní, Chiquitano, and Ayoreode, participating in its management, with special collaboration between the Capitaniá de Alto y Bajo Isoso (CABI) indigenous people's organization and SERNAP, the Bolivian national park service, which jointly work out management plans and budgets.
- » **Two MPAs in Indonesia (Bunaken) and the Philippines (Apo Islands)** are managed through collaborative arrangements with local communities. In both, poverty reduction benefits for local people included improved fish catches, health benefits, increased jobs, greater empowerment and benefits to women. Key to successes are co-management institutions involving local community representatives, participation of entire communities in management, legal backing to participation, and understanding and respecting customary use and access rights.
- » **In the Solomon Islands**, three communities co-manage along with provincial and national governments and an NGO the Arnavons Marine Conservation Area. This arrangement has brought two different cultural contexts in closer contact, while enhancing social cohesion and security among these isolated communities.



- » **In Canada, 16 of 42 national parks** are managed cooperatively between Parks Canada and the Aboriginal groups on whose traditional territories these parks are located. While these areas are Crown lands “set aside” under federal legislation for the use, benefit and enjoyment of all Canadians, local Aboriginal populations have either Aboriginal or treaty rights to continue traditional harvesting activities, subject to justifiable conservation restrictions. Additional economic benefits are generated from ecotourism and other activities.
- » **Community forests in many European countries and in the USA**, owned or managed by towns and local authorities, perform a mix of critical functions including: ecosystem benefits and services, recreation and wildlife refuge, timber and fuel supply. In New Hampshire, USA, towns such as Conway (650 ha), Gorham (2,000 ha), Randolph (4,100 ha) and Errol (2,100 ha) have been managing old or recently acquired tracts of forests. Some of these forests provide critical connectivity between national parks or wildlife reserves.
- » **In Italy, the Regole d’Ampezzo of the Ampezzo Valley** has a recorded history of community management for approximately 1,000 years, and contains the officially designated Parco Naturale delle Dolomiti d’Ampezzo while the Magnifica Comunità di Fiemme is collectively owned and managed by people of 11 townships.
- » **Community forests in many developing countries** provide important conservation and livelihood functions. In Nigeria, the Ekuri people are protecting 33,600 ha of dense tropical forest on their communal land, probably the largest communally controlled forest in the country. Over the last decade they have resisted the overtures of logging companies offering a road, which they desperately need, for logging rights. Instead, the Ekuri have prepared (with help from outside agencies) a five-year

management plan to generate sustainable benefits from the forest, while maintaining its cultural, wildlife and biodiversity values.

- » **In India, the states of Orissa, Uttarakhand, Maharashtra, Nagaland and others** have over 10,000 community-managed forests, ranging in size from a few to several hundred thousand hectares. Some are managed by all-women forest protection committees, others by youth clubs, yet others by the entire village. Many serve as important habitats for wildlife, or as corridors and buffers to designated protected areas.
- » Indigenous reserves account for a fifth of the Amazon forests, and have proven to be effective against illegal logging, mining and other threats that are destroying forests outside these reserves. These include reserves that have been integrated into national protected areas systems, such as the **Alto Fragua–Indiwasi National Park** of Colombia, established in February 2002 by agreement between the Colombian government and the Association of Indigenous Ingano Councils Tandachiridu Inganokuna.
- » Territories of mobile peoples often contain significant biodiversity values, conserved due to traditional practices of nomadism and deliberate restraint. In the case of the **Borana ethnic territory in Ethiopia**, customary law (seera marraa bisanii, or “the law of grass and water”) ensured sustainable use of scarce resources, and helped protect ecosystems harbouring the unique wildlife of the region (including 43 species of mammals) for centuries
- » The Locally Managed Marine Areas (LMMA) cover an extensive area of the southwestern Pacific. **Fiji has 200 traditionally established Locally Managed Marine Areas** or no-take areas, all of which are community-conserved areas. Throughout the Pacific, categories of management include community-based marine area management initiatives and collaborative management (national, NGOs, institutions and resource owners/users) of marine resources. LMMA tools include: no take areas or tabus, seasonal harvest and rotational harvest areas (temporary or permanent), species-specific harvest refugia (e.g., turtle and lobster moratoria) and restriction on fishing or harvesting efforts.



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