



## Policy Analysis Brief

# Economic Valuation of the Egyptian Red Sea Coral Reef



IT IS VITAL THAT THE EGYPTIAN REEFS BE PROTECTED from overuse and abuse that would undermine a key asset for Egypt and its economy because the reefs are such an important component of nature-based tourism, and because such tourism is a crucial component of Egypt's strategy for sustainable tourism development.

Investing now in reef protection will ultimately prove profitable. Protecting Egypt's world-class reefs would mean that, year after year, the Red Sea would continue to attract the diving community, which spends significantly more money for their vacations than do average tourists.

The Coral Reefs of Egypt  
Threats to the Reefs  
Interventions for Improvement  
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Conclusions  
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# The Coral Reefs of Egypt

## Egypt's coral reefs have:

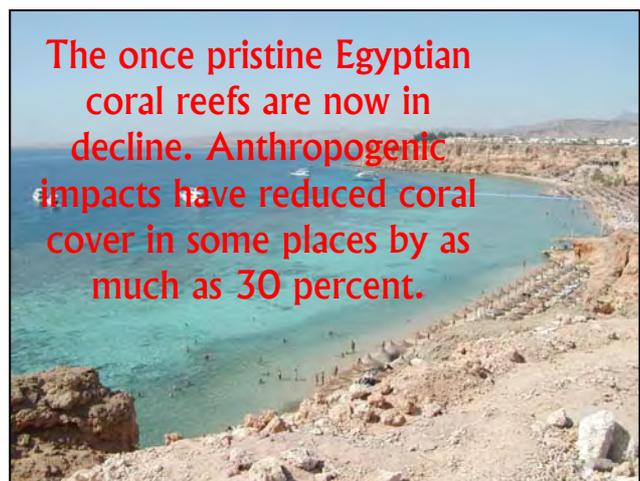
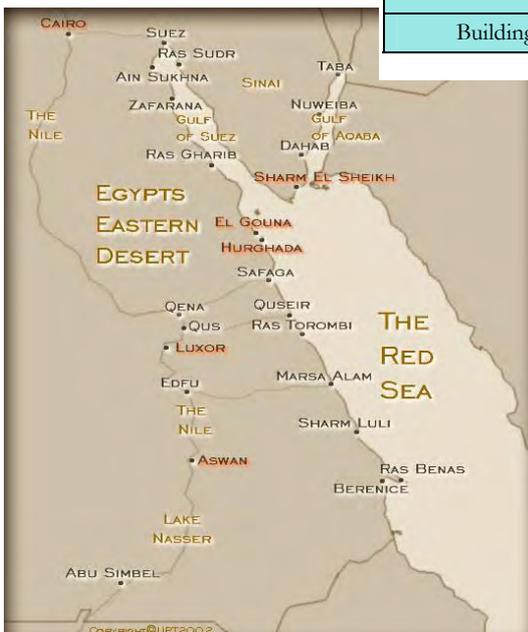
- Hundreds of hard and soft coral species
- Marine mammals
- Marine reptiles
- Mangroves
- Hundreds of species of fish

**Some of these are found only in Egypt**

SOME OF THE MOST SPECTACULAR CORAL REEFS and marine life in the world lie off the coast of Egypt, making them ideally located for the fast-growing European dive tourist market. Overall, tourism is the largest foreign exchange earning sector in Egypt with over 5 million foreign tourists per year. The 2.1 million coastal tourists are the largest sub-sector within that market. More than 540,000 foreign dive tourists visit the Red Sea annually, and they are especially attractive because they are willing to spend more on their holidays than other coastal tourists—if the reefs are attractive and the facilities are good.

Besides tourism, coral reefs also have unique biodiversity and are of great interest to scientists, students, conservationists, and pharmaceutical companies. In addition, reefs provide a natural barrier against wave erosion and natural hazards, protecting the built up infrastructure and human life. The table shows the range of services that coral reefs give mankind.

Service	Products
Social and cultural services (including tourism)	Support recreation, tourism, aesthetic values and artistic inspiration, sustaining the livelihood of communities support of cultural, religious and spiritual values
Physical structure services	Shoreline protection, build-up of land, promoting growth of mangroves and seagrass beds, generation of coral sand
Biotic services (within ecosystem)	Maintenance of habitats, biodiversity and a genetic library, regulation of ecosystem processes and functions, biological maintenance of resilience
Biotic services (between ecosystems)	Biological support through 'mobile links', export organic production etc. to pelagic food webs
Bio-geo-chemical services	Nitrogen fixation, CO <sub>2</sub> /Ca budget control, waste assimilation
Information services	Monitoring and pollution record, climate control
Renewable resources	Sea food products, raw materials and medicines, other raw materials (e.g. seaweed), curios and jewelry, live fish and coral collected for aquarium trade
Building materials	Sand for buildings and roads



## Threats to the Coral Reefs

Tourism is a double-edged sword, as direct damage is caused by tourist use of the reefs (trampling and divers breaking corals), damage from recreational boat anchoring and boat grounding, and through tourism facilities (sewage run-off, sedimentation, and coastal alteration). A variety of smaller threats occur from other anthropogenic impacts—over-fishing and destructive fishing, ship groundings, and pollution.



**Ship groundings and pollution**—The Suez Canal brings with it a large amount of international trade to be transported through the Red Sea. As a consequence, important coral reef ecosystems are under threat from ship groundings. Also, cruise ships and liveaboards dive boats in reef areas have caused major damage.

**Overfishing and destructive fishing**— Fish have always played an important role in the diet of Egyptians. There are reports of some unsustainable fishing practices along the Egyptian Red Sea coastline, including the use of closed mesh nets and even blast fishing. Shark finning and sea cucumber collection have appeared as major additional threats to Egyptian reefs. Removal of sea cucumbers could lead to increases in algae and bacteria in coral reef ecosystems with possibly disastrous consequences.



## Interventions for Improvement

Policy makers in Egypt understand the need to protect coral reefs to sustain tourism in the future and are making concerted efforts to minimize the impacts of the threats noted above. A number of initiatives have been undertaken to manage the sheer volume of tourists and the associated tourism facilities that have been having such adverse affects on the coral reefs. The Tourism Development Authority is developing the concepts of ecotourism and eco-lodging. And the United States Agency for International Development (and other donor agencies) has taken a long-term interest in programs for environmentally sustainable tourism.

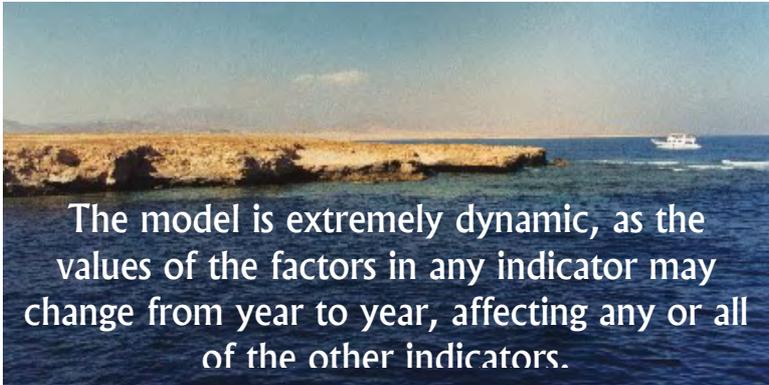
The Egyptian Environmental Affairs Agency, the monitoring and enforcement agency within the Ministry of State for Environmental Affairs, has a trained force of Red Sea Rangers, whose main job is to patrol the substantial portion of the coral reefs that are under some degree of protection. The Red Sea Governorate cooperates with both the Tourism Authority and the Environmental Affairs Agency to control growth and restrict exploitation of the reefs and adjacent areas.

### Other interventions include:

- Marine Protected Areas
- Terrestrial Protected Areas
- Integrated Coastal Management
- Controlling Tourist Access to Carrying Capacity
- Raising Public Awareness
- International Environmental Protection Agreements
- Legislation

# An Ecological–Economic Model

A DYNAMIC SIMULATION MODEL HAS BEEN DEVELOPED to address the environmental and economic complexities involved in coral reef ecosystems. The model links the ecological aspects of a coral reef to the economics of the coral reef use, that is the goods and services provided. Then the model gives a total overall economic value provided by the ecosystem. The model has been developed and tested in a number of other countries.



The ecological side of the model encompasses the interactive processes of one of the most productive and diverse ecosystems on earth while the economic model includes separate indicators for tourism, fisheries, and biodiversity, bioprospecting, and research.

Benefits from the reef ecosystem include:

- Benefits from direct uses including those that receive something of value from the reef ecosystem, principally tourism, but also fish or ingredients for medicines.
- Benefits from indirect use, which include production of nutrients for marine life, the value of coastal protection, and waste assimilation from mangroves.

## Components of the Economic Side of the Model

- Tourism
- Fisheries
- Biodiversity
- Bioprospecting
- Research

The Total Economic Value (TEV) is derived from the value of the sum for all years of all the goods and services provided by the coral reef ecosystems each year.

The main advantage of calculating the TEV is to know the value of the reef ecosystem, which will help stakeholders and policy makers understand the importance of conserving the reef ecosystem.

## Components of the Ecological Side of the Model

- Coral cover
- Coral diversity
- Fish stock
- Fish diversity
- Algae cover

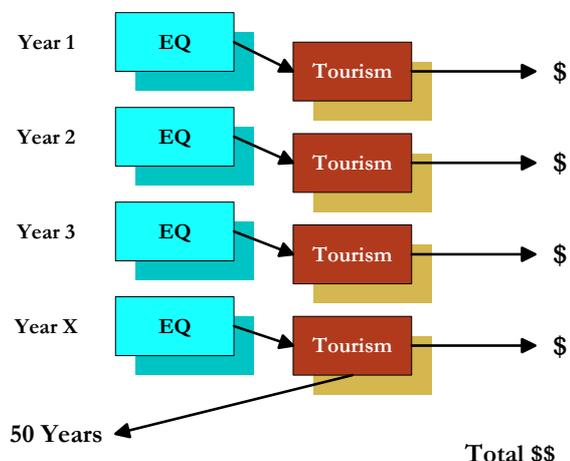
### Environmental Quality Affects Tourism

In the model the environmental quality in each year affects the amount of tourism that year and the amount of tourism each year affects the quality of the environment in the next year.

In other words,

- more tourist use → worse environment
- worse environment → less tourist use
- less tourist use → less value from the reef.

The model measures the total value of the tourism over 50 years.



# Conclusions

TWO SCENARIOS FOR A 50-YEAR TIME PERIOD WERE DEVELOPED to predict the value of the Egyptian coral reefs. The ecological and economic implications of the two scenarios are compared. In one, called **BUSINESS AS USUAL**, coastal development—particularly tourism of the types seen now—continues to grow at the present rate. Because better coastal management could minimize the impacts of tourism, a second scenario shows the potential benefits over time if the country moves towards better coastal management. This one is called **TOWARDS SUSTAINABILITY**.

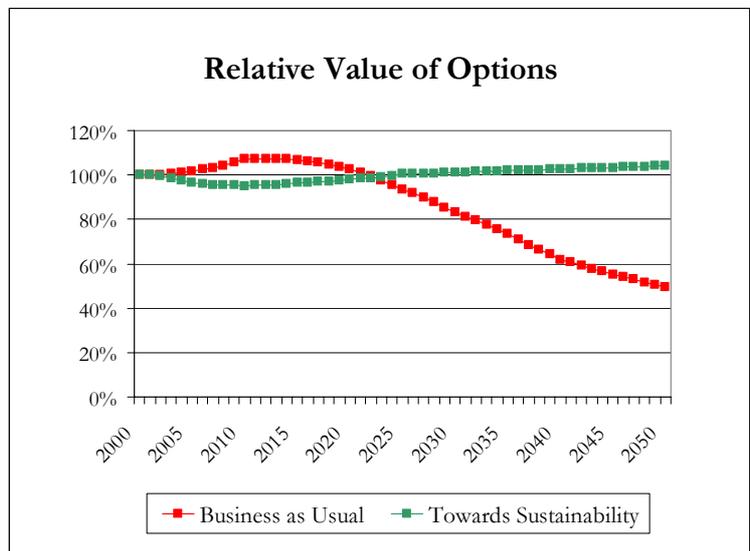
**BUSINESS AS USUAL:** The overall picture shows that if Egypt continues to develop at the current rate, the coral reefs will provide increasing economic benefits only in the short term. Growth continues at first but later, as the reefs become degraded with overuse, tourists begin to avoid certain areas of Egypt, and tourism decreases sharply. The net benefits will peak around the year 2012. After that, the increasing impacts of over-development and over-use will cause the value of the reef to decrease and it will continue to fall over time. By the year 2050, net benefits each year will be half of their value today.



**TOWARDS SUSTAINABILITY:** In contrast, if suitable management is implemented, while the number of tourists will decrease, the value added per tourist will increase, and overall annual net benefits will be slightly higher than they are currently each year.

Based on these net benefits, the value of the reefs can be calculated for each of the two future scenarios. The difference between the two scenarios in economic terms is an indication of the amount of money that would be justified to invest in management to promote sustainability. The stumbling block many find with sustainable management is shown in the graph on the right. When you look only at the immediate future, there is an incentive to manage unsustainably.

**This study looked at a time horizon of around two generations but if it took three generations instead, it is clear that the benefits of the TOWARDS SUSTAINABILITY scenario become even more pronounced.**





## Data Gathering and Fieldwork

BACKGROUND INFORMATION FOR THIS STUDY was collected on a host of issues, such as fisheries, marine protected area costs, ecological factors, coastal protection, and many others. The official literature provided rich information on the status of coral reefs, tourism impacts, and a number of additional items.

A tourism survey was fielded in December 2002 to obtain data on tourist perceptions and the socio-economic characteristics of tourism in the Marsa Alam area in the south. The survey was based on a marine tourism survey conducted in December 2001 and January 2002 in Hurghada and Sharm el-Sheikh. Both day-boat tourists (divers and snorkelers) as well as live-aboard guests were surveyed.

Collaboration with MVE came from EEPP partners, including the Government of Egypt Egyptian Environmental Affairs Agency in Cairo and Hurghada and the Tourism Development Authority, the EEPP Program Support Unit offices in Cairo and Hurghada and the Red Sea Sustainable Tourism Initiative, and the Egyptian consulting firm, Enviro-nics.

The MVE study team went to the Nabq and Ras Mohammed Protected Areas in Sinai, and they also traveled hundreds of kilometers along the Red Sea coast from the Giftun Islands Protected Area to Ras Banas, inspecting Wadi Gamal-Hamata, now a protected area, and other environmentally distinctive areas and tourism projects.

Many local people with direct experience on the Red Sea and a stake in its protection such as boat owners, dive operators, liveaboard boat operators, hotel managers, divers, tourists, and other knowledgeable people in the area, contributed their time and wisdom to the study.



EEPP

In the Egyptian Environmental Policy Program, or EEPP, the Government of Egypt and the US Agency for International Development have agreed on a number of policy changes to be made in a variety of areas relevant to the environment such as nature conservation, sustainable tourism, solid waste management, energy, and others. USAID provides the GOE with technical assistance to help carry these out and then disburses a cash transfer when the reforms are achieved.

MVE

As part of its mandate, the Monitoring, Verification, and Evaluation (MVE) Unit of the EEPP investigates cross-cutting policy issues such as that of conservation and development in the Red Sea. This present study should help the Egyptian authorities in their efforts to integrate environmental dimensions in the development plans of the Red Sea.



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USAID



USAID

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