



# How much are Saipan's Coral Reefs worth?

February 2006

## Policy Brief

### Introduction

The CNMI has some of the most beautiful and diverse coral reefs in the world, providing excellent recreational diving and snorkeling opportunities. These coral reefs are home to many forms of sea life. They are also important to the islands because they provide food, protect beaches from typhoon damage and erosion, support the economy, and help to maintain the environmental health of the oceans. Besides that, coral reefs are an important part of Saipan's culture. Have a look at the map of Saipan and see where the coral reefs are (Figure 1).

Coral reefs are the largest biological structures on earth, created by tiny plantlike animals called polyps. Corals may seem sturdy, but in fact they are quite fragile and need protection. Physical destruction, depletion of fish, habitat loss, global climate change, coastal development, and pollution contribute to the loss of coral reefs. It is estimated that nearly 27 percent of the world's reefs are already destroyed, and another two-thirds will be lost within 30 years if they are not protected.

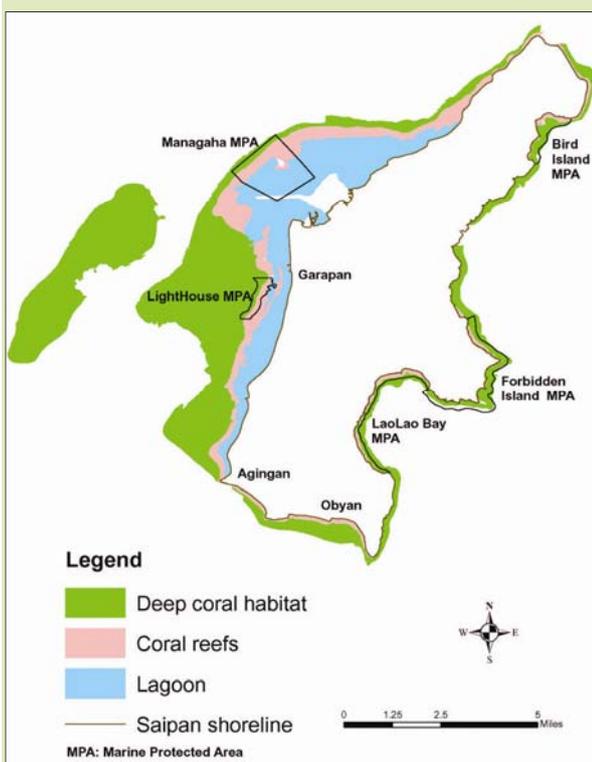


Figure 1. Coral reefs of Saipan



The situation in Saipan is not very different. When we get used to having something every day, we sometimes forget how special it is and take it for granted. Saipan is in danger of losing some of the benefits provided by its coral reefs. The fish are getting smaller and harder to catch, the lagoon is getting more polluted, and sediments run into our surrounding waters with every storm. This sediment contains chemicals and nutrients. When these wash into the sea they can change the quality of the water that coral reefs depend on.

The main problems facing Saipan's coral reefs include:

- Sewage outfalls and overflows
- Contamination from onsite wastewater disposal systems
- Rural runoff from unpaved roads and uplands cause sedimentation
- Urban runoff containing chemicals and nutrients
- Depletion of some types of reef fish
- Climate induced bleaching of coral reefs
- Illegal harvesting of corals
- Anchoring on the reef
- Divers and snorkelers who hit the bottom or take souvenirs

To help us learn to appreciate our reefs, we can work out how much they are worth to Saipan in dollars and cents. In 2004, CNMI hired a team of economists to work out the cash value of Saipan's coral reefs. This brochure tells you what they found and suggests what we can do to help protect the value of Saipan's coral reefs.

## Important Questions:

- How do we on Saipan use coral reefs? How important are coral reefs in our daily lives?
- It costs money to take care of coral reefs. Would people on Saipan be willing to pay to help protect the reefs? If so, how much?
- Tourists like to visit coral reefs and pay to go diving and snorkelling. Other activities such as selling reef fish also make money. What are the different ways that coral reefs bring in money for Saipan? How much is each activity worth each year?

All of this information was used to calculate the cash value of Saipan's coral reefs. This is called working out the **Total Economic Value**. Before we find out the cash value, let's see what the economists discovered.

## How do people on Saipan use coral reefs?

Four hundred different families were interviewed to find out. Here are the results:

### Fish to eat

Fresh fish is still an important part of mealtimes for people on Saipan. Most families eat fish two to three times a week. Most of this fish is purchased from stores or roadside vendors rather than caught by family members. However, nearly one third of bought fish comes from Saipan's reefs (31%). So, coral reefs are important in providing food to eat.



### Fishing

Fishing is an important cultural activity on Saipan, even if it is for pleasure rather than for catching fish to eat or sell. Twenty percent of all the people interviewed are active fishermen and go fishing once every week or two. The most popular fishing methods are spear fishing with snorkeling gear, hook and line fishing at shallow depths, and trolling. For some people, giving fish to family and friends is a way of showing they care for that person, while for others it is traditional. Only a few fishermen on Saipan sell part of their catch.



### Recreation

Coral reefs are part of daily life for many of us on Saipan. The study found that 94% of us swim and wade in the ocean, 97% of us have beach picnics and barbeques, 25% fish for reef fish, and 15% snorkel on a regular basis.

To continue enjoying these activities in the future, the families said that they needed three main things: clean, clear and safe water; good public facilities (e.g. barbeques and restrooms); and clean, wide beaches.

### Environmental Awareness

Many people who live on Saipan have noticed changes in the coastal environment. More than half said that it has gotten worse in their lifetime (58%). The water is much more polluted now and there are fewer fish to catch. Positive changes in fishery resources have been observed since the 2002 ban on the use of spear fishing with scuba, and the 2003 restrictions on the use of gill, drag, and surround nets in the CNMI. However, many people who live on Saipan have noticed that fishery resources in many areas are still not what they were in the past.

If you were the Governor of Saipan, what would you do to improve the coastal environment? All 400 families surveyed were asked this same question. The three most popular suggestions were:

- Improve the sewage system (e.g. repair and extend sewage pipes).
- Set and enforce stricter rules on development.
- Educate children and adults about the marine environment.

By asking people who live on Saipan about their relationship with coral reefs, we know that the coastal environment is extremely important to daily life. Imagine life without beach barbecues, swimming in the sea, snorkeling, eating fish for dinner and going fishing! People don't want to see their coastal environment change for the worse. So there is strong local support for better protection of coral reefs. But it costs money to take care of coral reefs. Would people on Saipan be willing to pay to help protect the reefs? If so, how much? Before we can answer that question, we need to look more closely at everything coral reefs provide.

### Local willingness to pay for protection of coral reefs

It is easy to measure some values of coral reefs on Saipan, such as the price of fish or seaweed. It is easy to measure some values of coral reefs on Saipan, such as the price of fish or seaweed. They are called market goods because they are sold through markets and have a cash value.

Other values of coral reefs are more difficult to measure, like beach visits and snorkeling. This is because they are not directly sold or traded in the market, and so are called **non-market goods** or values.



Coral reefs also provide a number of benefits such as coastal protection from storms. On Saipan, one cultural benefit provided by reefs is the seasonal runs of juvenile ti'ao (baby goatfish), e'e (jacks) and manahak (baby rabbitfish). These are times of special significance that bring families and friends together to share in the harvest. Again, these are hardly traded in the market so they don't have a cash value. However, it is important to include all goods and services in our calculation of **Total Economic Value** of coral reefs. This includes cultural benefit. This will give us a clear idea of just how much coral reefs in Saipan are worth.

The 400 Saipan families considered two **non-market values** of coral reefs to be equally important: recreation; and culturally important reef fish. People are willing to pay more tax (up to \$60 more each year per household) to reduce pollution, which they see as the main threat to the reefs. This is so they can continue to enjoy these values or benefits in the future.

### What are the different ways that coral reefs bring in money for Saipan?

Our study looked at how people who live on Saipan use coral reefs. Other people, such as tourists, also value coral reefs. In fact, the beautiful marine environment on Saipan is the main attraction for tourists. The economists looked at all the different benefits that coral reefs provide to Saipan. These are tourism, recreation, fisheries, coastal protection, amenity and research. The sum of these five benefits forms the Total Economic Value, the entire cash value of Saipan's coral reefs.

#### Tourism

Tourists mainly come to Saipan to enjoy the clean beaches and beautiful coral reefs. Nearly one third (30%) of all the money tourists bring into Saipan depends on healthy marine environments. With almost **half a million tourists** visiting Saipan every year, this value is estimated at as much as \$42 million per year. This large value shows that without a healthy marine environment, many visitors would choose to go to other destinations. This would lead to substantial losses to numerous companies and employees involved in the tourist industry of Saipan.



#### Recreation

There are many different types of ocean recreation on Saipan. They include diving, snorkeling, jet skiing, kayaking, padding, swimming, banana boating and windsurfing. People pay to do these activities so they

are an important source of income for the CNMI. The economists focused on diving and snorkeling, since these uses are the most dependent on healthy coral reefs. The average number of dives by tourists is around 200,000 per year and these are worth \$4 million dollars. If you add together the value of all the water sport activities it comes to \$5.8 million per year.

### Fisheries

Reef fish have been and are still an important part of the weekly diet on Saipan. Although there are noticeably fewer fish available to catch, coral reefs are still important places for fish to live. The market value of reef fish that are caught and sold for money is \$0.43 million per year. The non-market value of reef fish is the cultural value of fishing based on Saipan's fishing tradition, sharing fish with family and friends and enjoying the ocean. This value is \$0.83 million year (which is nearly twice as much as the market value). The total fishery value is \$1.25 million dollars per year.

### Coastal Protection

Coral reefs help to protect land and buildings on Saipan from storm damage. They do this by absorbing the energy from the waves. If there were no coral reefs on Saipan, there wouldn't be as much sand on the beaches. Houses and hotels built near the beach would also be much more at risk from storms. The coastal protection value of coral reefs in Saipan is about \$8 million per year.



### Amenity

Houses and hotels close to beautiful coastal environments are worth more money than those farther away. Beachfront houses that enjoy an ocean view are particularly valuable. Likewise, hotel rooms and condos can charge more if they are near the beach and have ocean views. The economists looked at lots of different information about land and real estate prices in Saipan. They estimated the amenity value was worth \$3 million per year.



### Research

Biodiversity is the number of different animals and plants in our environment. Natural and man-made disturbances have affected Saipan's coral reefs by reducing the number of species that can exist (biodiversity). Two ways to preserve biodiversity are to set up marine reserves and to manage our watersheds. Saipan has a number of marine reserves. These are important sites for producing fish and for monitoring and research about how coral reefs work. In the past seven years alone, federal grants and international organisations have provided more than \$5.5 million dollars to learn about Saipan's marine environment and biodiversity. That works out to a value of \$0.8 million per year.

## Total economic value

These five benefits (tourism, recreation, fisheries, coastal protection, amenity and research) were added together to find out the Total Economic Value of coral reefs in Saipan. The Total Economic Value is nearly \$61 million per year. That's how much money healthy coral reefs are worth to CNMI each year. They are a big asset to Saipan's economy and culture. Figure 2 is a pie chart that shows how much each benefit contributes to the Total Economic Value.

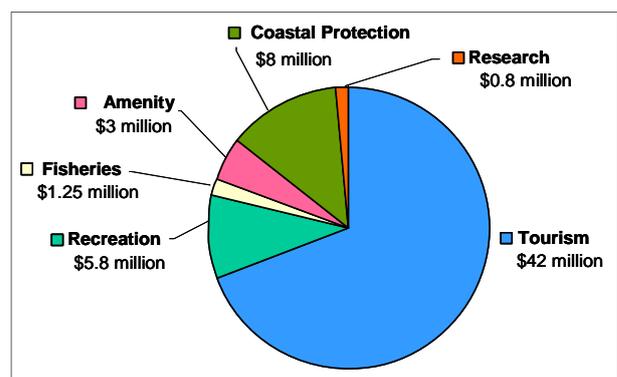


Figure 2. Total Economic Value of Saipan's coral reefs

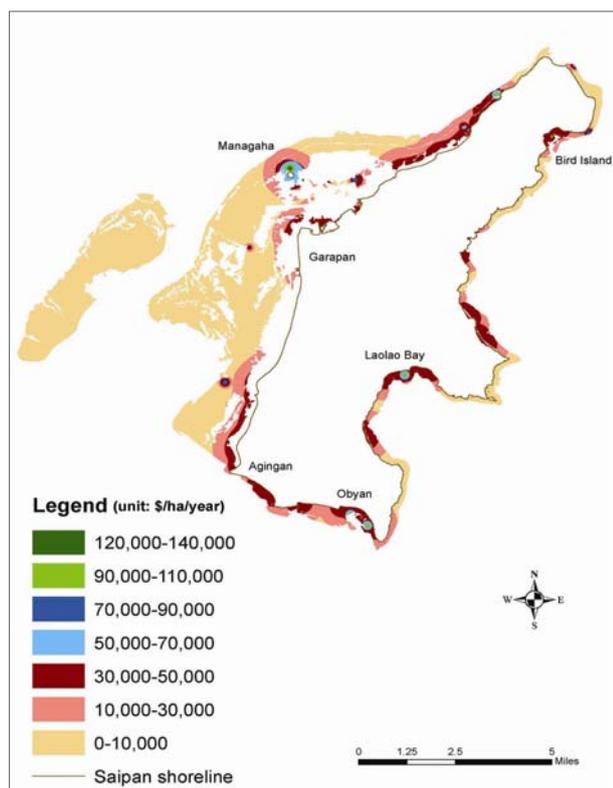


Figure 3. Total Economic Value (in \$ /hectare/year)

### Which reefs are the most valuable?

Not all of Saipan's coral reefs are worth the same amount of money. With a limited amount of money to spend on protection, CNMI needs to know which reefs are the most important. One way to work out which reefs are most valuable is to use a computer mapping tool called Geographic Information Systems. These maps show us the location of the most valuable reefs. They also show those reefs that are in most danger from pollution and muddy run-off (see Figures 3 and 4).

If you look at Figure 3, you will see that the most valuable reefs are the green ones. These are mostly small reefs located within 200 meters of the most popular diving and snorkeling spots (e.g. Managaha Island, Grotto). These reefs are worth nearly \$130,000 per hectare! The reefs that are in most danger from pollution and urban run-off are coloured brown on the second map (Figure 4). They are located just outside Garapan. The main source of pollution is nutrient-rich runoff from the Tapochau watershed that used to drain into Garapan wetlands. These wetlands filtered and cleaned the water but they were filled in mainly prior to WWII.

Now, stormwater carries nutrient-rich water directly to the reef. The Sadog Tasi sewage outfall represents a smaller contribution to pollution on Garapan reefs. If you look again at Figure 3, you may notice that some

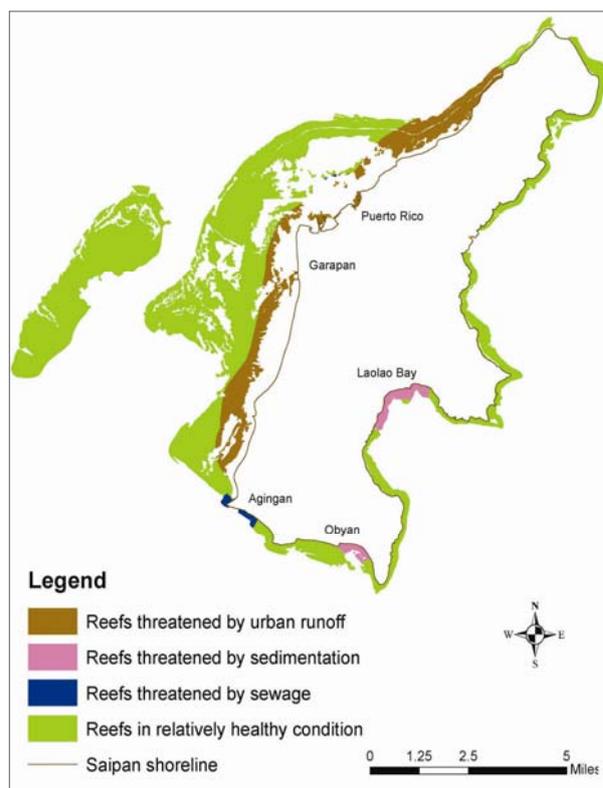


Figure 4. Threats to Saipan's reefs

of the most valuable reefs are the same as those in most danger from pollution! Valuable coral reefs in Laolao Bay and Obyan are also being affected by pollution and runoff from the land. This means that these are the areas that CNMI should spend money on first, in order to manage and protect reef values.

### How to protect the value of Saipan's coral reefs?

Here are some recommendations:

#### 1. Tackle the problem of pollution

Many people on Saipan are aware that pollution causes negative changes in the marine environment. Since some of the most valuable reefs are located within Garapan and Laolao Bay, these areas need special attention. Pollution problems need to be managed by:

- developing and implementing watershed management plans to control stormwater runoff;
- ensuring that the two sewage outfalls meet the local water quality standards; and
- making sure that we help everyone knows about the value of coral reefs.

#### 2. Remember that the ocean is part of local culture

Coral reefs and the ocean are part of daily life for many people on Saipan, and have been for hundreds of years. Many people are concerned about the changes they have noticed in the marine environment.



They want to see reefs protected in the future. So, there is strong local support for coral reef management. Saipan residents can also help fund coral reef protection. Many people interviewed said they would be willing to pay higher taxes for better management of the marine environment. New public campaigns that help people learn about the value of coral reefs would help to strengthen this bond. Good examples of public campaigns that already exist on Saipan are:

i) CRM sign at Wing Beach about habitat protection

- ii) DFW education programs on endangered species issues
- iii) DLNR signs at entrances to the Bird and Forbidden Island and
- iv) DEQ education programs on coral reef water quality and pollution.

### 3. Actively involve tourists in the protection of coral reefs

The main attraction for tourists visiting Saipan is the beautiful marine environment. However, coral reefs are fragile and large numbers of visitors do cause some problems. For example, poor diving and snorkeling practices can damage the reefs. Our study found that tourists would be willing to pay a fee (\$1 to \$10 per visit) to visit Saipan's Marine Protected Areas. This is because they value the beautiful marine environment. It is important that this money is spent directly on coral reef management. Then tourists feel good that they are helping to protect something special. They also know that the reefs will be there for them to enjoy in the future.



This report was prepared by Cesar Environmental Economics Consulting under awards CRI-3, 4 and 5 from the US Department of the Interior and National Oceanographic and Atmospheric Administration. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the Department of Interior, NOAA, or the government of the CNMI.

This brochure is based on a technical report that is available at the Coastal Resources Management Office. An electronic copy is available on the CRMO website at <http://www.crm.gov.mp>.

For more information, contact the CNMI Coastal Resources Management Office at Tel: 670-664-8300 or through the website.

The author, Pieter van Beukering, may be reached at [beukering@ivm.vu.nl](mailto:beukering@ivm.vu.nl).

### Authors:

Pieter van Beukering, Kate Gallop, Wolfgang Haider, Margo Longland, Joel Sablan, Ben Beardmore, Esther Wolfs, Yi Liu, Kim van der Leeuw, Sabina di Prima, Eric Massey, Herman Cesar, Grace Omega Garces, Zeke Hausfather.

