

Reefs cheaper than concrete to protect coast cities

May 13 2014, by Richard Ingham



Fish swim in the coral reef of Bunaken Island national marine park in northern Sulawesi on May 14, 2009

Coral reefs are as good as concrete defences at protecting tropical coastal cities from rising seas but are far cheaper, scientists said in a study published on Tuesday.

Instead of committing billions of dollars to build breakwaters and sea

walls, many tropical cities should consider conserving or restoring their [coral reefs](#), they said.

The paper, published in the journal *Nature Communications*, coincides with findings that the West Antarctic icesheet is starting to collapse—a phenomenon that will slowly drive up sea levels over hundreds of years.

Researchers led by Michael Beck at the University of California at Santa Cruz estimated that coral reefs dissipate up to 97 percent of the energy that waves would otherwise deliver to a shoreline.

The seaward edge of the reef, called the crest, is by itself responsible for dissipating 86 percent of the energy.

Nearly two-thirds of the remaining energy is then buffered by the reef flat, the shallow part of the reef that extends outward from the shore.

Overall, this natural shield leads to a reduction in wave height of 64 percent on average, comparable to a reduction of 30-70 percent achieved by a system of detached breakwaters, according to the study.

Beck's team also did a rough cost analysis: the average price for a tropical breakwater project was \$197 million (143 million), compared with \$129 million for restoring a reef.

"We find that restoring reefs is significantly cheaper than building artificial breakwaters in tropical environments," they wrote.

An additional advantage comes in the long-term bill, they added: "Reefs have the potential for self-repair and thus lower maintenance costs as compared with artificial structures."



People clamber over seaside rocks in Melbourne on October 27, 2009

Around 100 million people living close to the sea at altitudes of less than 10 metres (32 feet) could benefit from risk reduction by reefs, according to the study.

Indonesia, India and the Philippines account for half of the tally. The United States would also be among the top 10 beneficiary countries.

Rising seas

The UN's Intergovernmental Panel on Climate Change (IPCC) estimated last September that sea levels would creep up by 26-82 centimetres (10-32 inches) by 2100, driven partly by ice melt and partly by expansion of the ocean as it warms.

But some experts say this estimate is too conservative, in the light of grim findings published Monday that said the West Antarctic icesheet

was now melting at an unstoppable pace.

Sridhar Anandakrishnan, professor of geosciences at Pennsylvania State University, said "something like 90 cm" would be a likelier figure.

Rising seas attack coastlines and increase the flooding impact of storm surges, or waves that are whipped higher by powerful cyclones that make landfall.

To protect vulnerable cities on coastlines and estuaries, many countries are eyeing plans to build concrete walls and groynes.

Spending on dikes alone is predicted to rise to \$12-71 billion by 2100, according to an estimate published in the US journal *Proceedings of the National Academy of Sciences (PNAS)* earlier this year

According to a 2011 report by the UN International Strategy for Disaster Risk Reduction, 3.6 percent of the world's [gross domestic product](#) (GDP) was annually exposed to tropical cyclones in the 1970s.

This rose to 4.3 percent of GDP in the first decade of the 21st century.

Previous research has highlighted the usefulness of mangroves and marshes as natural protections against the ocean threat, but relatively little has been done into coral reefs, a complex ecosystem badly threatened by over-fishing and warming seas.

Beck's team cautioned, though, that far more research was needed to get a clearer picture of the costs of reef restoration, as well as the benefits that could derive fishing and tourism.

More information: Conservation efforts are most often directed to more remote reefs, however the study suggests there should also be a

focus on reefs closer to the people who will directly benefit from reef restoration and management. In terms of number of people who receive risk reduction benefits from coral reefs, the top 15 countries include:

Indonesia, 41 million

India, 36 million

Philippines, 23 million

China, 16 million

Vietnam, 9 million

Brazil, 8 million

United States, 7 million

Malaysia, 5 million

Sri Lanka, 4 million

Taiwan, 3 million

Singapore, 3 million

Cuba, 3 million

Hong Kong, 2 million

Tanzania, 2 million

Saudi Arabia, 2 million

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