



WAVES
Managing coasts
with natural
solutions
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Managing coasts with natural solutions

The World Bank published groundbreaking guidelines in February 2016 for measuring and valuing the coastal protection benefits of mangroves and coral reefs.

In the last 30 years, the amount of the world's gross domestic product (GDP) annually exposed to tropical cyclones has increased by more than US\$1.5 trillion. Insurers alone have paid out more than US\$300 billion for coastal damages from storms in the past 10 years, with payments often going towards rebuilding similar coastal infrastructure equally vulnerable to coastal storms and flooding.

Governments worldwide are dedicating billions of dollars to reduce risks from disasters and climate change. The Total Fast Start Finance commitments under the United Nations Framework Convention on Climate Change (UNFCCC) in 2012 include around US\$3 billion for climate adaptation assistance. Middle-income countries, such as Brazil, China and Colombia, are making multibillion-dollar investments to address climate-related risks. Yet most of these funds are for creating and maintaining 'grey infrastructure' — seawalls and breakwaters, for example.

There is an important and cost-effective way to help deal with this

risk. When integrated into the mix of coastal infrastructure solutions, coastal and marine habitats — particularly coral reefs and mangroves — can substantially reduce exposure and vulnerability, providing people and infrastructure with cheaper, more flexible and enhanced protection.

Mangroves can reduce wave height by between 13 and 66 per cent over a 100-meter-wide belt, and by 50 to 100 per cent over a 500-meter-wide mangrove belt. If mangrove forests are large enough, they can reduce storm surge peak water levels by between 4 and 48cm per kilometer of mangrove. In low-lying areas, even relatively small reductions in peak water levels can reduce flooding, and prevent property damage.

Coral reefs protect coasts from erosion and flooding by reducing wave energy and supplying and trapping sediment found on adjacent beaches. Coral reefs reduce wave energy by up to 97 per cent. Healthy reefs can protect coasts even during cyclones with strong wave conditions. They keep pace with sea level rise and require little direct maintenance.

Key points

- Mangroves and coral reefs provide significant coastal protection benefits
- The Annual Expected Benefits of natural coastal protection can be rigorously valued
- Many countries are already using these natural coastal protection benefits in policy and practice.

New guidelines

Through the World Bank's Wealth Accounting and Valuation of Ecosystem Services (WAVES) global partnership, the World Bank and a team of economists, ecologists and engineers led by The Nature Conservancy have published a new report: *Managing coasts with natural solutions: Guidelines for measuring and valuing the coastal protection services of mangroves and coral reefs*.¹

1. World Bank 2016. *Managing coasts with natural solutions: Guidelines for measuring and valuing the coastal protection services of mangroves and coral reefs*. M W Beck and G-M Lange (Eds). Wealth Accounting and the Valuation of Ecosystem Services Partnership (WAVES). World Bank, Washington DC.





The guidelines present ways to measure and value nature-based solutions in a manner consistent with national economic accounts, and to include these services in other decision-making processes to support planning for development, disaster risk and coastal zone management.

At the center of the guidelines is a recommended approach for ecosystem service valuation — the Expected Damage Function (EDF) approach — which is adapted from engineering and insurance industry approaches to assess risks and benefits. This approach works by examining what flooding levels are now and what they would be if these reefs or mangroves were lost. The difference in flooding level and the social and built capital that exists between those flooding levels, is the expected benefit from keeping those reefs and mangroves in place.

The guidelines also point to examples of nature-based solutions being effectively integrated into major policy decisions, including:

- In Vietnam, 9,000 hectares of reforested mangroves demonstrated cost benefit ratios ranging from 3:1 in some communities to as high as 28:1 in other locations
- In the aftermath of Typhoon Haiyan of 2013, the Government of the Philippines pledged US\$8 million for a cash-for-work program to restore mangroves and beach forests along the hardest hit coastlines

- The Caribbean Catastrophic Risk Insurance Facility (CCRIF) found that in seven out of the eight countries examined reef and mangrove restoration was one of the most cost-effective approaches to coastal risk reduction and adaptation.

Key recommendations

Already, much of the world's wetlands and reefs and their benefits have been lost or are highly threatened. Integrating the coastal protection value of mangroves and reefs in policy and management decisions would be an important step forward, as there are substantial opportunities and risks that will affect the ecosystems and the communities that rely on their services over the next five to 10 years.

- Harness the power of coral reefs and mangrove forests in reducing flooding and erosion
- Use the Expected Damage Function approach to value coastal protection benefits; Replacement Cost methods are a second best alternative
- Advance country pilot projects that value natural protection benefits and include them in national accounting
- Map where habitat conservation and restoration provide significant risk reduction value
- Develop large-scale commitments to conserve and restore degraded mangroves and coral reefs to cost effectively reduce coastal risks
- Include reefs and mangroves in national adaptation plans (for developing nations) or adaptation and risk reduction support programs (for developed nations).