Economics
of Coastal Adaptation

The Nature Conservancy

New app evaluates coastal risk and identifies where nature can be used to reduce risk and save tens of billions of dollars.

Coastal communities are at high and growing risks from storms, sea level rise and flooding. Climate change and coastal development are further increasing risks to people and property and threatening coastal habitats. The need to upgrade existing flood protection and to plan for future coastal risks is becoming increasingly apparent, as are the costs.
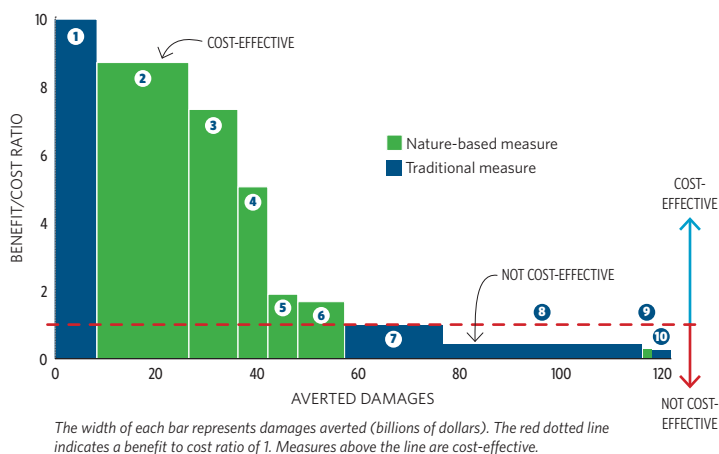
Loss of coastal habitats like marshes, mangroves, oyster reefs, coral reefs and sea grasses worsens the situation by further exposing communities and assets to flooding and erosion. Habitat loss has been shown to increase loss in the Gulf of Mexico, where from 2001 to 2005 the loss of wetlands increased property damage caused by flooding by an average of approximately $1.5 million per year across the coast.

As risks increase in the coastal zone, decision-makers want to find cost effective solutions for reducing risk. A growing body of literature suggests that nature-based solutions can reduce

risk, but there have been few direct, comparisons of the cost effectiveness of nature-based versus artificial measures. To address this need, The Nature Conservancy teamed up with the reinsurance company Swiss Re to advance the Economics of Climate Adaptation (ECA) application, which examines the costs and benefits of natural and built solutions together using industry-based approaches. The ECA app, part of the Coastal Resilience online decision support system, assesses present and future risks and evaluates the cost effectiveness of both nature-based (green) and artificial (grey) solutions to reduce coastal hazards risk and avert damages across the Gulf of Mexico.

The ECA app compares the cost effectiveness of different solutions for risk reduction ranging from habitat restoration to home elevation. The app evaluates how much flood damage each solution can avert as well as how cost-effective each solution is to implement.

Comparison of the costs and benefits of Risk Reduction measures

The width of each bar represents damages averted (billions of dollars). The red dotted line indicates a benefit to cost ratio of 1. Measures above the line are cost-effective.

MEASURE	CRITERIA
❶ Sandbags	Used in 2.9 million houses for all category 3 hurricanes across all counties in the study area
❷ Wetland Restoration	6 counties with the highest losses in assets where at least 25 miles of salt marsh could be restored by bay
❸ Oyster Reef Restoration	1,000 miles restored in all counties with high suitability
❹ Barrier Island Restoration	All Mississippi coastal counties
❺ Wetland Conservation	125 miles of wetlands protected
Beach Nourishment (❻ East Coast and ❾ West Coast)	All coastal counties in Florida (East Coast) and Texas (West Coast)
❼ Local Levees Priority	6ft "hills" built to protect 532,000 existing houses on the 6 counties that experience most damages
❽ Home Elevation	Elevate 481,841 existing houses by 8ft in 6 counties that experience the most damages
❿ Shoreline Levees	20ft levees constructed around Houma & New Orleans, LA - 340 miles

Screenshot of the Economics of Coastal Adaptation App on the Coastal Resilience tool
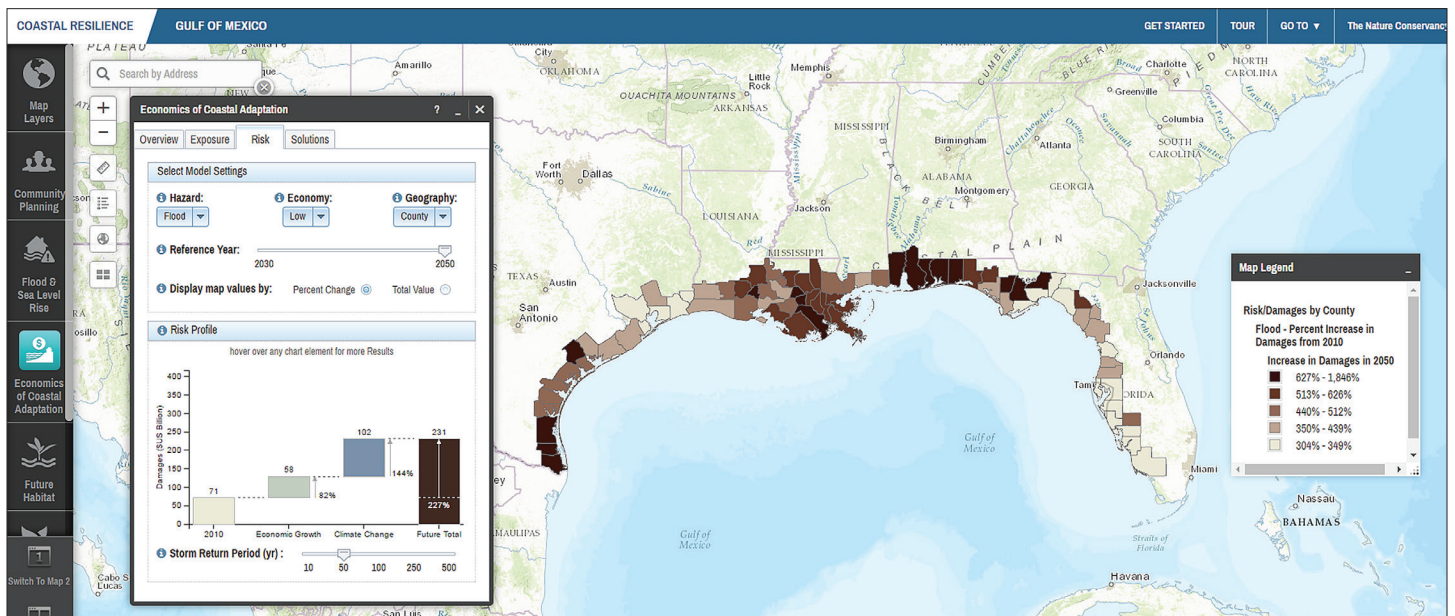
Risk assessments and cost-benefit analyses that incorporate natural defenses are relevant for insurers, lenders, agencies, and communities that are seeking viable and cost-effective solutions for reducing risk. While the Economics of Coastal Adaptation app demonstrates that future risks from coastal hazards will be significant, it also illustrates that a suite of cost effective solutions, including nature based defenses, can reduce risk and avert damages for millions of people in the Gulf of Mexico.

To explore the Economics of Coastal Adaptation App in the Gulf of Mexico, please visit maps.coastalresilience.org/gulfmex

Key findings

→ Economic growth will continue to be a major driver of risk but climate change will provoke more recurrent losses;

→ Oyster reef and marsh restoration are some of the most cost effective solutions for risk reduction;

→ Nature-based defenses alone could help avert more than $50 billion in damages over a 20 year period in the Gulf;

→ The cost-effectiveness of adaptation solutions depends significantly on where these projects are done, which should influence regional priorities;

→ The natural and artificial measures can be compared with one another using open-source, risk-industry based tools. We are more readily able to analyze and quantify value- and people-protected measures across present and future coastal hazards and socioeconomic development, across many scenarios, and make the values spatially explicit.