

# Climate change: Can nature help us?

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Saltmarshes starting to be inundated by the tide at Abbots Hall, Cumbria, UK.  
Credit: Iris Moller

(Phys.org) —Hard-engineered sea walls have a limited life span. Could saltmarshes and mangroves offer a different approach to buffering against storm surges and coastal erosion?

Flooding, landslides, [crop failure](#), water shortages. Across the globe, the frequency with which humans are suffering the ill effects of climatic variability and [extreme weather events](#) is on the increase. Can [natural environments](#) be used effectively to help people adapt to the effects of [climate change](#)? The first systematic review of this question – facilitated by the Cambridge Conservation Initiative (CCI) Collaborative Fund for

Conservation – finds much evidence of their effectiveness.

"The delays in international agreements on ways to reduce global [greenhouse gas emissions](#) mean that planning to counter the impacts of climate change is a necessity," said Robert Munroe, Climate Change Officer at BirdLife International. "Governments of all countries should be making plans to protect us against these impacts."

One adaptation option is to invest in costly, large-scale structures such as sea walls, [irrigation systems](#) and dams. But while their short-term impact is clear, these solutions lead to ever-increasing maintenance costs and often have negative impacts on local ecosystems and biodiversity.

"International policy makers are having to think about the different approaches they could take, but the problem is that they don't have enough information to make informed decisions," said Munroe.

"Hard-engineered sea walls have a limited [life span](#), and we know that they change wave and tidal currents, often to the detriment of saltmarshes or mangroves that act as a natural buffer to storm surges and [coastal erosion](#). Do we really want to lose these buffers and face increasing costs of sea wall maintenance?" asked Dr Iris Möller, Deputy Director of the Cambridge Coastal Research Unit in the Department of Geography.

"There's anecdotal evidence from events like the 2004 Indian Ocean tsunami that villages surrounded by mangroves were significantly less affected by the tsunami than more exposed areas," she added. The mangroves may have saved thousands of lives and properties by absorbing a large proportion of the energy in the waves.

But local anecdotal evidence is not enough to provide a reliable measurement of the effectiveness of an approach. Now a review has

been completed of the effectiveness of natural approaches to buffering the effects of climate change. Termed Ecosystem-based approaches for Adaptation (EbA), this relatively new concept incorporates approaches that have been used for a long time to address climatic variability, but not necessarily in the context of adaptation to climate change.

"We wanted to understand what the research evidence tells us, in terms of the relative importance of ecosystems as opposed to hard-engineering solutions to the same problem," said Dr Bhaskar Vira in the Department of Geography. Vira, Möller, Dr Tom Spencer (Director of the Cambridge Coastal Research Unit) and Dr Andreas Kontoleon (Department of Land Economy) worked with climate change policy expert Munroe at BirdLife and climate change expert Dr Nathalie Doswald at the United Nations Environment Programme World Conservation Monitoring Centre, as well as with the International Institute for Environment and Development in London. They looked at published studies from around the world in which a wide range of EbA had been assessed. The step-by-step detail of their systematic review method was published in *Experimental Evidence* in 2012, which will enable it to be replicated for consistency in future studies.

"The systematic review is very specific: we sifted out the most relevant published studies and compiled evidence from them on the different interventions being used and how effective they have been," said Vira. The team found that activities related to EbA have been used across the globe to address a broad range of climatic hazards and impacts.

Interventions include the sustainable management of wetlands and floodplains to act as floodwater reservoirs and provide important water stores for times of drought, and the conservation and restoration of forests and natural vegetation to stabilise slopes and regulate water flows, preventing flash floods and landslides due to increased rainfall. Most of the approaches were reported by the studies to be effective in reducing

human vulnerability to the effects of climate change, climatic variability or natural hazards.

"The results are providing general guidance on the circumstances in which an EbA may be useful," said Vira. "There are cases where it isn't necessarily going to be helpful – if you live in Gloucestershire and you're about to get flooded, you can't start planting trees, you have to use sandbags. These interventions take time, and there are limitations to their effectiveness."

"It's important to work towards fully informed decision-making between alternative adaptation approaches," said Munroe. "Large-scale infrastructural solutions may tend to be pursued because the financial costs are clear and their short-term effectiveness at buffering hazards has been tested by engineers. But by constraining natural ecological cycles, they may increase social vulnerability in the medium to long term. We found some discussions on the comparison between ecosystem-based and other kinds of approaches to adaptation, which are valuable for policy makers."

"We also realised there are some real knowledge gaps," added Möller. "We need information on the costs as well as the benefits, and on whether monitoring systems have been put in place to assess the long-term effectiveness of these approaches. With respect to ecosystems as coastal protection, for example, we need to know exactly how much energy mangroves and marshes absorb and what we can do to maximise and maintain the effect."

The project collaborators recognise that the divide between scientific research and policy making must be bridged if governments are to make the best decisions for long-term adaptation to climate change. "Our partnership with NGO colleagues meant the project has both academic rigour and a built-in pathway to impact," said Vira. The Collaborative

Fund for Conservation, which was established with the generous support of the Arcadia Fund, was set up explicitly to foster these innovative partnerships.

The team's collective range of contacts has enabled them to disseminate their results and recommendations. Their presentations at the United Nations Climate Change Conference in Durban in December 2012, and the distribution of briefing papers and guidance documents, have drawn the attention of decision-makers at the highest levels to the possibilities of ecosystem-based approaches.

"A technical workshop on EbA, likely to involve 70 countries, was recently convened by the Climate Change Convention," said Munroe. "Our work contributed to the momentum that resulted in this decision. It's really exciting as it's the first time the Convention has met to discuss this approach."

"EbA is an important tool in the adaptation toolkit, which has often been ignored because the evidence base had not been made clear," said Munroe. "Employing it alongside other adaptation options will result in much more sustainable responses to the [effects of climate change](#) in both developed and developing countries."

Provided by University of Cambridge

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