



Lake Durankulak Ramsar Site, Bulgaria. Photo © Sergey Dereliev

## Shoreline stabilisation & storm protection

The power of natural phenomena such as hurricanes, cyclones, storm-surges and tsunamis (tidal waves generated by earthquakes beneath the ocean floor) to destroy human lives and livelihoods was graphically underlined for the entire world by the Indian Ocean tsunami of December 2004 and by the aftermath of Hurricane Katrina, which devastated the city of New Orleans in August 2005.

Worldwide, an estimated 200 million people who live in low-lying coastal regions are at potential risk from catastrophic flooding. As sea-levels continue to rise and with global climate change leading to increasingly turbulent weather, the vulnerability of these communities is growing year on year, placing unprecedented pressure on civil protection and emergency planning budgets.

Coastal wetlands – such as reefs, mangroves and saltmarshes – act as frontline defences against potential devastation. The roots of wetland plants bind the shoreline together, resisting erosion by wind and waves and providing a physical barrier that slows down storm surges and tidal waves, thereby reducing their height and destructive power.

These ecosystem services are provided free of charge by nature, but where protective wetlands have been destroyed by human activities, costly artificial flood defences have to be built in their place. Many countries simply cannot afford to construct or maintain engineered defences, leaving many communities increasingly exposed to danger. The need to recognize the contribution that conserving and restoring healthy wetlands can make – for free – to protecting coasts around the world from catastrophic flooding has never been greater.

### In brief...

- Some 200 million people live in low-lying coastal regions at risk from catastrophic flooding caused by hurricanes, storm surges and tidal waves.
- The risk of coastal flooding is increasing due to global climate change.
- Wetlands provide natural frontline defences against storms and tidal waves by slowing the speed and reducing the height and force of floodwater.
- Mangroves and saltmarsh plants literally bind the shoreline together.
- In 2005, Hurricane Katrina killed 1,400 people in the USA and caused US\$75 billion in damage. Loss of protective coastal wetlands due to human activities significantly worsened Katrina's impact.
- In the Caribbean, the shoreline protection services provided by coral reefs are valued at up to US\$2.2 billion annually.
- In the UK, 'managed realignment' uses the natural function of wetlands to protect shorelines, providing cost-effective, environmentally friendly flood-protection solutions.

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Hurricane Katrina killed more than 1,400 people, mostly in Louisiana, displaced hundreds of thousands more and caused damage estimated at US\$75 billion. The vulnerability of New Orleans to flooding in the wake of Katrina was made worse by the progressive loss of the Mississippi River Delta, caused in large part by human activities. For example, a significant part of the river-borne sediments that once maintained the delta's protective network of coastal wetlands and barrier islands is now trapped behind upstream dams and levees (flood banks) and the delta is shrinking through lack of new sediment deposits. The storm-surge associated with Katrina was also able to travel rapidly along straightened navigation channels, while much of the river's natural 'safety valve' – its floodplain – had been drained and developed.

In the countries most affected by the 2004 Indian Ocean tsunami, over a quarter of the area of mangroves had been destroyed by human activities between 1980 and 2000, and many of the remaining mangroves were damaged or destroyed by the tidal wave.

Governments, UN agencies and NGOs are collaborating through the 'Mangroves for the Future' initiative to restore mangroves and other coastal ecosystems – and thus their ecosystem services – as a 'building block' for post-tsunami sustainable development.

A 2005 assessment of the 200-hectare Rekawa mangrove/lagoon ecosystem in Sri Lanka found that the total economic value was about US\$217,600 per year, of which erosion control and buffering against storm damage accounted for US\$60,000.

In the Caribbean, the annual net benefits provided by coral reefs through shoreline protection services are estimated at US\$700,000 to \$2.2 billion. For St Lucia alone, the annual value of shoreline protection services provided by coral reefs (in potentially avoided damage) is estimated to be between US\$28 million and US\$50 million. Coral reefs contribute to the protection of more than 40% of the island's shoreline.

In the UK, the concept of 'managed coastal realignment' is being applied at a growing number of sites. Recent research has shown that in purely economic terms it can be more cost effective to restore the natural shoreline protection afforded by wetlands than to maintain and upgrade existing engineered defences. Wetland restoration also provides gains for biodiversity, recreation and tourism, particularly where coastal wetlands are being squeezed out between rising sea levels and artificial flood banks.

Due to sea-level rise, the artificial flood-protection embankment at Freiston Shore, adjoining part of 'The Wash' Ramsar Site in eastern England, was coming under increasing pressure from wave attack during high tides. It was estimated that if the embankment was breached in a storm surge, the resulting damage would approach GBP20 million. The cost of repairing and maintaining the embankment over a period of 50 years was estimated at GBP2.47 million, whereas a managed realignment option was costed at GBP1.98 million, affording flood protection over a longer period of time. Restoration began in 2002 and the area now contributes GBP150,000 annually to the local economy, with a four-fold increase in visitor numbers attracted by the opportunities for wildlife-based recreation.



*Green-backed Heron in mangroves in the Ciénaga Grande Ramsar Site, Colombia. Photo © Maria Rivera*



CONVENTION ON WETLANDS

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