



Will any wetlands survive future sea level rise?

Only wetland environments with high sediment input from rivers can keep pace with rising sea levels, according to a new study. However, human activity is destroying wetlands' natural defences, making their survival increasingly unlikely. The researchers call for sustainable management approaches to protect wetlands under future climate change projections.

Wetlands, including marshes, lagoons and river deltas, are areas of land that are permanently or seasonally saturated with water and are considered to be the most diverse of all ecosystems. However, they are very vulnerable to fluctuations in sea level since they are low-lying, coastal features. Researchers from the EU-funded MEDDELDT project¹ looked at the survival chances of different types of wetland under IPCC climate change projections, which forecast an average sea level rise of 4 millimetres per year until 2100².

The researchers monitored 55 individual stations over a ten-year period (1992-2002) in four coastal systems in the Ebro delta (Spain), the Rhône delta (France), the Po delta (Italy) and the Venice Lagoon (Italy). The wetlands represented a range of types: freshwater wetlands with high river input, marine wetlands with low river input and inland wetlands (freshwater or saltwater marshes) with little or no river input.

The researchers found that more than five times as much sediment was delivered to wetlands with high river input than to the marine stations. This meant that build-up of sediment, or accretion, was much quicker where the river input was high. In the inland marshes, sediment accretion was close to zero.

The scientists also measured the change in height, or surface elevation, at the different sites. This is not necessarily the same as measuring sediment accretion because certain factors can cause the land to sink by several millimetres per year, such as the compaction of recently delivered sediment or the extraction of shallow subsurface oil and gas.

In the Rhône delta, average surface elevation was significantly higher in the high river input sites than in the marine sites: 11.4 millimetres compared to 1.6 millimetres per year. Similarly, in the Ebro delta, average surface elevation was 9 millimetres per year in the high river input sites compared to 0.4 millimetres per year in the marine sites. Surface elevation in all inland wetlands was less than 2 millimetres per year.

These results indicate that only wetland environments that are well served by rivers will have enough sediment build-up to stay above projected sea level rise of 4 millimetres per year, under the impacts of climate change, and avoid flooding of their valuable ecological assets. However, researchers state these wetlands will only be able to maintain these natural defences against sea level rise if they are not damaged by human activity. Building dams and dikes to help regulate water levels in urban areas has changed river input into many deltas worldwide, reducing the rate of sediment accretion. These human-induced changes, together with sea level rise, will significantly lower the ability of wetland environments to tolerate future changes.

Measures to encourage or reinstate sediment accretion in wetland systems could include relocating sediment currently trapped in reservoirs, the controlled release of river water back into wetland environments from dammed areas and the restoration of natural hydrology in coastal areas.

1. MEDDELDT (**Impact of Climatic Change on Northwestern Mediterranean Deltas**) was supported by the European Commission under FP3 (contract EV5V-CT94_0465). See: <http://lim-ciirc.upc.es/eng/r+d/pro/meddelt/index.htm>
2. See: IPCC 4th Assessment Report (2007) projections on global sea level rise www.ipcc.ch/publications_and_data/ar4/wg1/en/ch10s10-6-5.html

Source: Day, J., Ibáñez, C., Scarton, F., *et al.* (2011). Sustainability of Mediterranean deltaic and lagoon wetlands with sea-level rise: the importance of river input. *Estuaries and Coasts*. 34: 483-493.

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