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How wetlands can help us adapt to rising seas

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Abstract
Instead of costly levees and seawalls, coastal ecosystems could offer an alternative way to protect Australia's coastal communities from rising seas, saving money and storing carbon along the way. Sea levels around Australia are likely to rise 40 cm and up to 60 cm by 2100, driven by rising temperatures and melting ice-caps. The latest Intergovernmental Panel on Climate Change report on climate impacts and vulnerability shows more people will be at risk of flooding as a result of sea level rise. The report also focuses heavily on adaptation, and coasts show just how that might work.

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How wetlands can help us adapt to rising seas

Coasts are at risk from rising seas, but that risk could be alleviated by coastal ecosystems such as mangroves.

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Sea levels around Australia are likely to rise 40 cm and up to 60 cm by 2100, driven by rising temperatures and melting ice-caps. The latest Intergovernmental Panel on Climate Change report on climate impacts and vulnerability shows more people will be at risk of flooding as a result of sea level rise. The report also focuses heavily on adaptation, and coasts show just how that might work.

Our coasts are already dynamic places, seeing regular erosion and inundation. In the past, poor recognition of this fact has left infrastructure and assets vulnerable — now increasingly so, thanks to sea level rise. If we’re to decrease the risk of future losses, we need to plan now to adapt. One way we could do so is by looking to nature.
Living coastal defences

Coastal ecosystems, such as wetlands, can increase the resilience of shorelines to erosion and inundation. This is starting to be recognised by coastal engineers, particularly in the US and Europe. Known as “living shorelines”, coastal wetlands are being constructed as an alternative to traditional engineering structures such as seawalls.

This “eco-engineering” is also starting to be recognised as a way for Australia to adapt to one of the 21st century’s major challenges.

Constructing wetlands, or helping existing wetlands retreat and accommodate rising seas, could offer significant economic gains while protecting coasts. Living shorelines could save between 30-80% of the cost of constructing hard structures such as seawalls, and once established they have minimal ongoing maintenance costs.

In Australia, tidal floodgates on the Hunter River in NSW once held back tidal waters. Now the river is a beacon for coastal adaptation. Tidal flow is being restored to the coastal floodplain, converting marginal farmland and freshwater wetlands into mangrove and saltmarsh.

The new habitat will provide more nurseries for fish. Costings from mangrove habitats show that this could generate A$14,000 per hectare each year to commercial fisheries.

Coastal wetlands are also amongst the most efficient ecosystems at sequestering carbon from the atmosphere. Expanding our wetlands could go some way to Australia’s climate mitigation efforts. In a paper recently published in the journal Estuaries and Coasts, we estimated how much carbon could be stored on the Lower Hunter.

We found 280,000 tonnes of carbon could be stored by 2100 if floodgates are opened and wetlands are helped to retreat and accommodate rising seas. Based on a carbon price derived from the European Union’s emissions trading system (fluctuating between A$7.30 and A$46.40 per tonne), we calculated the carbon sequestered in these wetlands could be worth between A$2 million and A$13 million in a carbon sensitive economy.

Irrespective of a mandated emissions trading scheme, this sequestered carbon may potentially provide financial incentives for coastal wetland restoration and conservation, through programs such as REDD+ and voluntary carbon markets like Verified Carbon Standard.

Working with nature

There are other ways to work with nature on our coasts, and these may have benefits beyond adapting to sea level rise. All of the following examples are already in practice in parts of coastal Australia.

Adding sand to beaches to protect them from sea level rise and storms can also minimise loss of amenity, unlike traditional seawalls.

Sand bypass projects build upon traditional beach nourishment by shifting sand from channels used for navigation to beaches where it is needed. Dredge spoil is being used in the same way on estuarine shorelines.

Oyster beds are being established as bulkheads to reduce wave action. And dunes are being rehabilitated to provide a buffer, as well as habitat for wildlife such as turtles and penguins.

Working with nature also applies to planning. Development should be confined to those areas that are already resilient to sea level rise, only approving developments in areas resistant to erosion and above the height impacted by rising seas and storm surges.
Planning also extends to coastal ecosystems. Sensible planning would acknowledge that coastal ecosystems produce many benefits, including protection from sea level rise. Local, state and federal governments need to start discussing how to accommodate the migration of coastal ecosystems as a result of sea level rise. Boundaries of coastal ecosystems will change. Planners need the vision to recognise this, and resist pressure from those who won’t.

Our coastal future will be different to our coasts as we know them. We now know some of the ways we can adapt to this future.