

Science for Environment Policy

'Blue carbon' stored in vegetated coastal systems could be underestimated

Vegetated coastal ecosystems, such as mangroves, marshes and seagrasses, are an important carbon sink and their destruction increases greenhouse gas (GHG) emissions. A new study estimates that 0.15-1.02 Pg (petagrams) of CO₂ are being released annually from degradation of these valuable ecosystems, resulting in economic losses of US\$6-42 billion (€4.68 to 32.81 billion) per year.

It is widely known that deforestation leads to increases in GHG emissions, as forests store large quantities of carbon. Vegetated coastal ecosystems' ability to store carbon, known as 'blue carbon', is less well known. The study aimed to be the first to provide a comprehensive estimate of global GHG emissions due to the conversion of vegetated coastal ecosystems to other land uses.

The study used figures from previous research on: the total global area of vegetated coastal ecosystems (marshes, mangroves and seagrasses), the percentage of these ecosystems being lost per year and the carbon stocks in these habitats that is susceptible to loss. It focused only on the biomass (plant material) and the top metre of sediment as scientific understanding of carbon losses from deep sediment is not yet adequate enough.

Using these figures, it estimated that the conversion and degradation of vegetated coastal ecosystems may release between 0.15 and 1.02 Pg of CO₂ each year. Destruction of mangroves contributes approximately half the estimated total 'blue carbon' emissions (0.09 to 0.45 Pg). Destruction of seagrasses contributes the second largest amount (0.05 to 0.33 Pg), owing to their larger global area, whilst tidal marsh destruction contributes the least (0.02 to 0.24 Pg), as marshes cover a relatively small global area.

To put this into perspective, the study's mid-way estimate of emissions caused by degradation of vegetated coastal ecosystems (0.45 Pg of CO₂ per year) is approaching the annual CO₂ emissions from fossil fuel consumption in the UK. It is estimated that the loss of vegetated coastal ecosystems may contribute an additional 3-19% to the recent estimates of emissions from deforestation.

Assuming a cost to society of US\$41 (€32.02) per megagram (Mg) of CO₂ emitted, the study estimates that the current global cost of the destruction of vegetated coastal ecosystems is US\$6-42 billion (€4.68 to 32.81 billion) per year. A major driver of the loss is that landowners profit more from converting natural coastal land for other uses, such as agriculture.

The analysis suggests that GHG emissions from the conversion of vegetated coastal ecosystems are larger than previously thought. There are several uncertainties around these figures, which is reflected in the wide ranges for the estimates. More research is needed to improve estimates of the amount of carbon stored in these ecosystems, the amount of carbon released into the atmosphere by land conversion, and the geographical location of where carbon loss is occurring most rapidly.

However, the study argues that the uncertainties should not discourage the development of policies and protocols for reducing carbon emissions from these coastal ecosystems or compensating stakeholders for conserving them.



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www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0043542

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