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Mangrove restoration has ecological and economic benefits, report reveals

by [University of Tokyo](#)



Funding to restore mangrove forests is money well spent, according to a new meta-analysis by ecological economists at the University of Tokyo. For every dollar spent to restore mangroves, the ecosystem will yield \$6.83 to \$10.50 in returns over the next 20 years. The range reflects different economic projections of how much immediate costs are worth compared to future benefits and reflects the significant ecological benefits that degraded habitats receive from mangrove restoration. The findings were recently published in *Nature Communications*.

Ecosystem restoration has become a significant feature of global policy agendas. The current United Nations Decade on Ecosystem Restoration (2021-2030) prioritizes conservation and restoration of wetland ecosystems, such as mangroves. The ongoing deliberations of the U.N. Convention on Biological Diversity Post-2020 Framework have

defined five conservation goals for 2050, one of which is restoration of at least 20% of ecosystems, including freshwater and marine habitats.

"The most important point is that now, in the face of the post-2020 framework and the U.N. Decade on Ecosystem Restoration, we can see that yes, there are real ecological benefits and economic value in restoring mangroves," said Associate Professor Alexandros Gasparatos from the Institute for Future Initiatives at the University of Tokyo.

Mangrove forests are made of shrub and tree species that tolerate hot, muddy and salty conditions, thriving along saltwater shorelines of 118 tropical and subtropical countries. Experts estimate that mangroves are among the most carbon-rich forests in the tropics, sequestering up to four times as much climate-warming carbon than rainforests per unit area. The dense tangle of roots and branches acts as a barrier against storm surges and wind, and also serves as a critical nursery for seafood species, as well as birds and other wildlife.

However, mangroves are at risk primarily from climate change, coastal development, pollution and human exploitation. Globally, mangroves decreased by 1.4 million hectares (3.5 million acres) between 1990 and 2020 and continued to be lost at 0.13% on average globally every year from 2000 to 2016.

In tandem with strong efforts to conserve remaining healthy mangroves, ambitious projects have helped reverse the downward trends of the recent past by restoring mangroves in degraded areas, mudflats and abandoned aquaculture ponds. Over the past 40 years, 2,000 square kilometers (772 square miles) of new mangrove trees have been planted and potentially 8,000 sq. km (3,089 sq. miles) of previously deforested mangrove areas have been identified as suitable for restoration.

"The outcomes of mangrove restoration are not a new topic, but the majority of research projects are field studies that examine only one or two specific sites for a limited number of ecological outcomes. Thus, we miss the 'big picture.' This inspired me to aggregate all these results, to know how restored mangroves perform compared to other mangrove conditions globally," said doctoral student Jie Su, first author of the publication.

Su extracted data from 188 published studies on mangrove ecosystems in 22 countries, mostly in East and Southeast Asia. Managing all of the data originally collected and published by other researchers is complex, but diligent meta-analyses allow researchers to find this "big picture" understanding, which would be impossible with just one independent study.

"Restored mangroves performed slightly worse than natural mangroves for most of the individual ecosystem functions studied, but the important thing is they performed much better than the unvegetated mud, sand flats or abandoned aquaculture ponds, and they were on par with degraded and naturally regenerated mangroves," said Su.

"The best option is to protect mangrove forests from degradation. However, our analysis clearly shows that restoring mangroves is an ecologically and economically sound choice," said Gasparatos.

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More information: Jie Su et al, A meta-analysis of the ecological and economic outcomes of mangrove restoration, *Nature Communications* (2021). [DOI: 10.1038/s41467-021-25349-1](https://doi.org/10.1038/s41467-021-25349-1)

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