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## Ecosystems for disaster risk reduction: what is the scientific evidence?

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Calls are rising for ecosystems, or green infrastructure, to complement engineered infrastructure for more effective disaster risk reduction and climate governance. Key international framework agreements, including the Sendai Framework for Disaster Risk Reduction 2015-2030 and the 2021 Glasgow Pact, noted the importance of ensuring the integrity of all ecosystems in addressing climate change and disaster risk. For example, vegetation can stabilize slopes to reduce mountain hazards and sand dunes, mangroves, and/or seagrasses can reduce the impacts of coastal storms. However, there are gaps in the scientific evidence on this topic with few comprehensive, peer-reviewed studies to support decision-making on green infrastructure for disaster risk reduction.

This study systematically reviews 529 English-language articles published between 2000 and 2019. The objective was to catalogue the extent of knowledge and confidence in the role of ecosystems in reducing disaster risk. The main question this review addresses is: What is the evidence of the role that ecosystem services and/or functions contribute to disaster risk reduction? We modified the review methodology established by the Intergovernmental Panel on Climate Change to identify the robustness of evidence and level of agreement on the role of ecosystems in attenuating most common types of hazards.

The data demonstrate very robust links on the role of ecosystems in forest fire management, urban flooding and slope stabilization to reduce mountain hazards in a cost-effective manner. The study also highlights how ecosystems provide multiple services and functions in addition to regulating hazards, e.g., provisioning services for reducing vulnerability. The review highlights several research gaps, notably a geographic concentration of studies on urban areas of Europe and North America, and insufficient policy-relevant research on coastal, dryland, and watershed areas, especially in Asia, Africa and Latin America. To conclude, more attention should be paid to filling these research gaps and developing performance standards, which would provide policy-makers with increased confidence in investing in green infrastructure for disaster risk reduction and climate governance.

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