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## Scientific evidence of the economic benefits of ecosystem-based disaster risk reduction and ecosystem-based climate change adaptation

**Marta Vicarelli**<sup>1</sup>, Michael Kang<sup>2</sup>, Madeline Leue<sup>2</sup>, Aryen Shrestha<sup>3</sup>, David Wasielewski<sup>2</sup>, Karen Sudmeier-Rieux<sup>4</sup>, Jaroslav Mysiak<sup>5</sup>, Simon Schütze<sup>6</sup>, Michael Marr<sup>2</sup>, Shannon McAndrew<sup>2</sup>, and Miranda Vance<sup>2</sup>

<sup>1</sup>Department of Economics and School of Public Policy, University of Massachusetts, Amherst, United States of America (mvicarelli@econs.umass.edu)

<sup>2</sup>School of Public Policy, University of Massachusetts, Amherst, United States of America

<sup>3</sup>Amherst College, Amherst, United States of America

<sup>4</sup>United Nations Environment Programme

<sup>5</sup>Centro Euro-Mediterraneo sui Cambiamenti Climatici | Università Ca' Foscari, Venezia, Italy

<sup>6</sup>United Nations University and University of Bonn, Germany

Ecosystems and ecosystem services are key to helping achieve reduction in disaster risk, sustainable development, and climate change adaptation, and this is now recognized by major international framework agreements (Convention on Biological Diversity, 2014; United Nations Office for Disaster Risk Reduction, Sendai Framework for Disaster Risk Reduction, 2015-2030). However, there is limited knowledge about the cost efficiency and socio-economic equity outcomes of Nature-based Solutions (NbS) compared to traditional engineered strategies.

In this study we developed a global database of more than 130 peer-reviewed studies, published between 2000 and 2020, that perform economic evaluations of NbS for Ecosystem-based Climate Adaptation (EbA) and Ecosystem-based Disaster Risk Reduction (Eco-DRR). Using meta-analysis techniques, we assess the existing scientific knowledge on the economic viability and performance of NbS for Eco-DRR and EbA, cataloguing outcomes both in terms of degree of economic efficiency and social equity. Our analysis includes multiple dimensions: geographic distribution of the published studies, types of ecosystems and ecosystem services evaluated, hazards and climate impacts analyzed, and economic methodologies used to perform economic efficiency evaluations (e.g., cost benefit analysis, stated/revealed preferences evaluation methods).

This study builds on a recent global assessment (Sudmeier-Rieux et al, 2021) that performs the first systematic review of Eco-DRR peer-reviewed studies across all disciplines. Their results show robustness of evidence and level of agreement on the role of ecosystems in attenuating 30 types of hazards, based on the assessment methodology established by the Intergovernmental Panel on Climate Change (IPCC). Our meta-analysis expands the 2021 review by evaluating the economic benefits associated with Eco-DRR and NbA approaches; by examining cost efficiency of Eco-DRR

and NbA interventions compared to traditional engineering solutions; by performing equity assessments of the outcomes; and by studying how the NbS interventions reviewed contributed to the sustainable development goals (SDGs).

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