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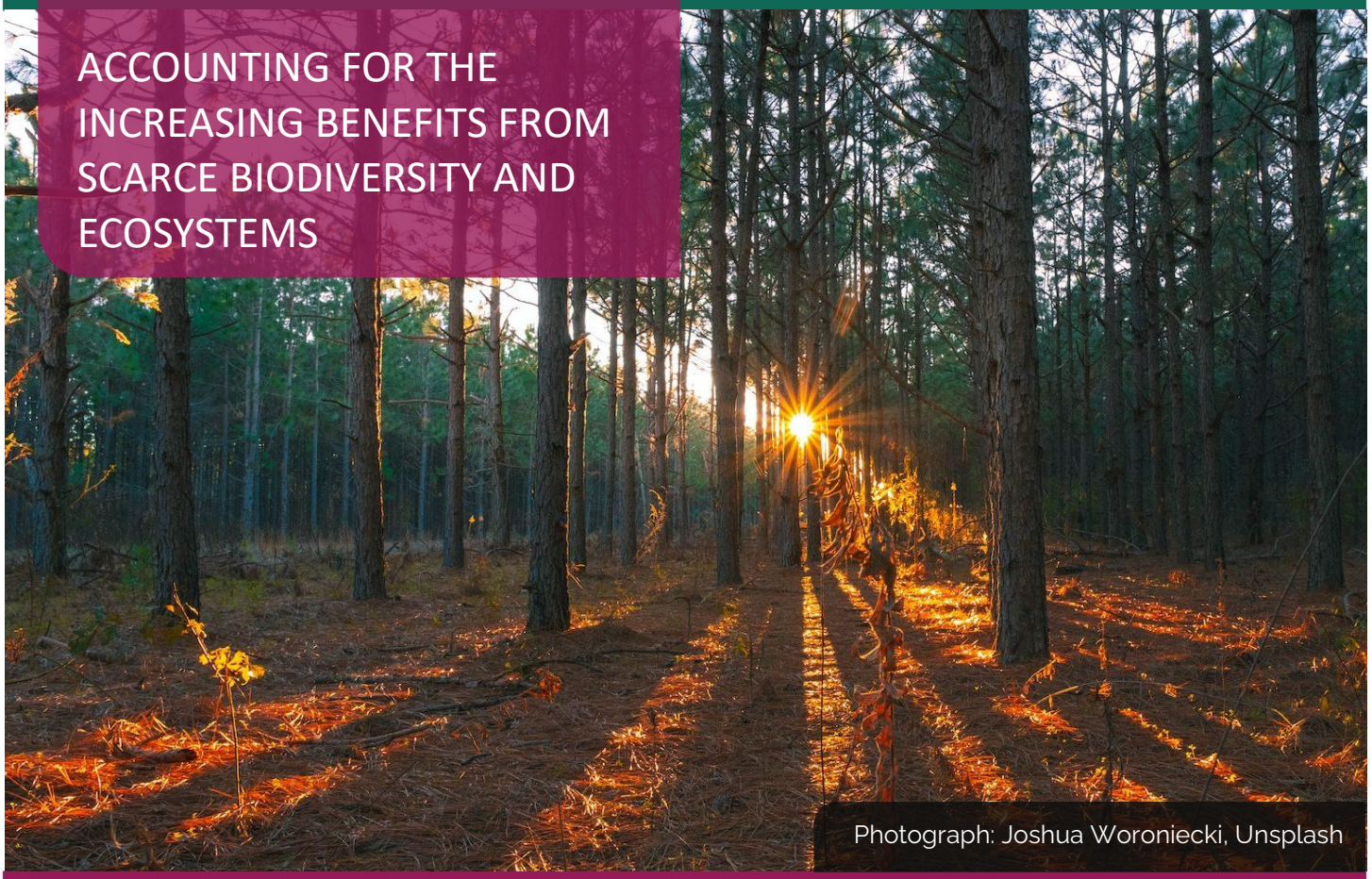
REPORT

ACCOUNTING FOR THE INCREASING BENEFITS FROM SCARCE BIODIVERSITY AND ECOSYSTEMS



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This paper addresses a key omission in how governments account for biodiversity and ecosystem services in benefit–cost analysis: the widespread assumption that the value of ecosystem services remains constant over time. While policy guidance routinely adjusts future benefits of health, travel time, and safety for income growth, ecosystem services are typically treated as having a fixed willingness to pay (WTP).

Authored by:

Summary of Drupp et al. (2024, *Science*) and Drupp et al, (2025, *EARE*).

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Accounting for the Increasing Benefits from Scarce Biodiversity and Ecosystems

Research and policy question

This paper addresses a key omission in how governments account for biodiversity and ecosystem services in benefit–cost analysis: the widespread assumption that the value of ecosystem services remains constant over time. While policy guidance routinely adjusts future benefits of health, travel time, and safety for income growth, ecosystem services are typically treated as having a fixed willingness to pay (WTP). The core policy question is how future benefits from ecosystem services should evolve as societies become richer and ecosystems become increasingly scarce, and how failing to account for these dynamics biases public investment and regulatory decisions.

Methodological approach

The authors draw on economic theory and empirical evidence from non-market valuation to derive a simple, policy-relevant rule for adjusting future ecosystem service values. Using a constant elasticity framework, they show that changes in WTP for ecosystem services depend on two forces: growth in real income and changes in the physical supply of ecosystem services. These forces are combined in a Relative Price Change (RPC) rule, which adjusts future WTP as a function of income growth and ecosystem service scarcity, scaled by the income elasticity of WTP. The paper proposes a transparent default elasticity value that can be applied regardless of how current ecosystem values are estimated, making the rule compatible with existing benefit–cost analysis practices.

Findings

The analysis shows that ecosystem services become increasingly valuable over time for two reasons. First, as incomes grow, people are willing to pay more for non-market goods, including ecosystem services. Second, many ecosystem services are stagnating or declining, making them scarcer relative to market goods and, in some cases, scarcer in absolute terms. When both effects are accounted for, future WTP for ecosystem services rises substantially faster than assumed under current policy guidance. Applying the RPC rule can increase the present value of ecosystem service benefits by more than 100% over a century under conservative scenarios, and by several hundred percent when ecosystems are in decline. Neglecting these effects therefore leads to systematic undervaluation of long-term environmental benefits and underinvestment in conservation.

Policy implications

The paper argues for an immediate revision of policy guidance on benefit–cost analysis to incorporate income and scarcity effects for ecosystem services. The authors propose a new default assumption under which WTP for ecosystem services increases proportionally with real income, aligning ecosystem valuation with how governments already treat other non-market goods. Where information on ecosystem decline is available, additional adjustments should reflect increasing absolute scarcity. Implementing the RPC rule would make public investments in

conservation, biodiversity protection, and climate policy more accurately reflect intergenerational welfare impacts. More broadly, the approach helps level the playing field between market and non-market goods, ensuring that the importance of scarce ecosystems for future generations is properly accounted for in regulatory analysis and public decision-making.

Interactive Policy Tool

Drupp et al., led the development of an interactive web application that operationalises the theoretical and empirical insights from the Science paper. The tool allows users to explore how ecosystem service values evolve under alternative assumptions about income growth, ecosystem decline, and income elasticities of willingness to pay, implementing the Relative Price Change (RPC) rule proposed in the paper. The Shiny app was designed by Drupp et al. to support policy analysis, teaching, and sensitivity testing, and the BIOADD team collaborated on the underlying research that informed its development.

Links and materials

Drupp, M. A. et al. (2024). Accounting for the increasing benefits from scarce ecosystems. Science. https://www.science.org/doi/10.1126/science.adk2086

Drupp, M., Turk, Z., Heckenhahn J. and Groom, B. Global Evidence on the Income Elasticity of Willingness to Pay, Relative Price Changes and Public Natural Capital Values. *Environ Resource Econ* **88**, 3765–3804 (2025). https://doi.org/10.1007/s10640-025-01042-5

Interactive tool: https://moritzdrupp.shinyapps.io/increasing-benefits-from-scarce-ecosystems/

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Economic Policy Decision Making for Biodiversity

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