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Insight

Transforming the economic landscape for global sustainability

Victoria Reyes-García [1,2,3], Ram Pandit [4,5,6], Karina Benessaiah [7], Arun Agrawal [8,9], Lucas A. Garibaldi [10], Chinwe Ifejika Speranza [11], Karen O'Brien [12], Timothée Parrique [13] and Sebastian Villasante [14,15]

ABSTRACT. The economic system's interdependent relationship with nature is fraught with contradictions. While over half of global GDP moderately or highly depends on nature and subsidies to sectors driving nature's decline, e.g., agriculture, fossil fuels, forestry, amount to trillions of dollars annually, funding for biodiversity conservation and restoration remains woefully inadequate. Bridging the biodiversity funding gap is crucial but alone does not ensure ecosystems' health. Beyond innovative economic instruments and the elimination or reform of harmful subsidies, a selective downscaling of production and consumption has been proposed as a transition strategy to lower the overall ecological footprint of the economic system. Only by aligning economic flows with the biophysical limits of the planet can we envision a future where human well-being coexists with ecological integrity.

Key Words: *biodiversity financing gap; environmental harmful subsidies; sustainability; transformative change*

INTRODUCTION

Economic activities are inextricably embedded in nature. Yet, the structure of the global economy, centered on the pursuit of economic growth, is driving nature's degradation at alarming rates and to unprecedented levels (Díaz et al. 2019). In 2023, over half of the world's Gross Domestic Product (GDP), approximately US$58 trillion, was generated by economic activities moderately to highly dependent on nature (Evison et al. 2023). Despite this interdependence, economies continue to degrade and undermine their own foundations: current biodiversity funding levels are drastically insufficient, activities that drive nature's decline are heavily subsidized, and global monetary flows do not account for material limits (Dasgupta 2021).

THE ECONOMIC LANDSCAPE OF GLOBAL SUSTAINABILITY

The stakes are high: the decline of nature either creates or amplifies a range of economic, social, and political risks across nations and sectors. The cost of severe impacts to nature's contributions to people, such as natural pollination, marine capture fisheries, and timber sourcing from native forests, on the global GDP is estimated at 2.3% (US$2.7 trillion) annually by 2030 (Johnson et al. 2021). Moreover, this estimate, based on a global computable general equilibrium model that simulates the loss of selected ecosystem services, captures only a subset of nature's contributions and excludes non-market values and broader ecological feedbacks. Importantly, these projected losses could be significantly amplified by the compounding effects of climate change (Pörtner et al. 2021). For instance, recent climate-economic modeling estimates that funding needs for loss and damage associated with climate impacts in vulnerable developing countries could reach US$395 billion in 2025, with a possible range of US$128–937 billion (Tavoni et al. 2024). Such climate-related impacts may accelerate ecosystem degradation and further destabilize nature's contributions, rather than simply adding linearly to the projected economic damages. All countries will be affected, although low- and lower-middle-income countries would be the hardest hit, potentially facing GDP reductions of over 10% (Johnson et al. 2021). These risks are often underestimated, both because human societies have maintained a persistent and intrinsic dependence on nature throughout history (Dasgupta 2021) and because the current global economic and financial systems largely fail to account for how economic activities contribute to nature's degradation, affecting both current and future generations (Crona et al. 2021).

The prevailing economic model, centered on infinite growth and profit maximization, is a major driver of resource depletion (Haberl et al. 2020), biodiversity loss (Otero et al. 2020), and climate change (Jackson and Victor 2019). This model promotes short-term, individualistic, and material gains, often at the expense of long-term sustainability, disconnection from and domination over both nature and people, and the concentration of power and wealth. These three factors have been identified as the underlying causes of biodiversity loss (IPBES 2024). These priorities have not only shaped policies but have also justified substantial government subsidies to industries contributing to environmental degradation. Globally, direct subsidies to sectors that favor unlimited extraction over sustainable management, such as fossil fuels, agriculture, forestry, infrastructure, fisheries, aquaculture, and mining, are estimated to range from US$1.4

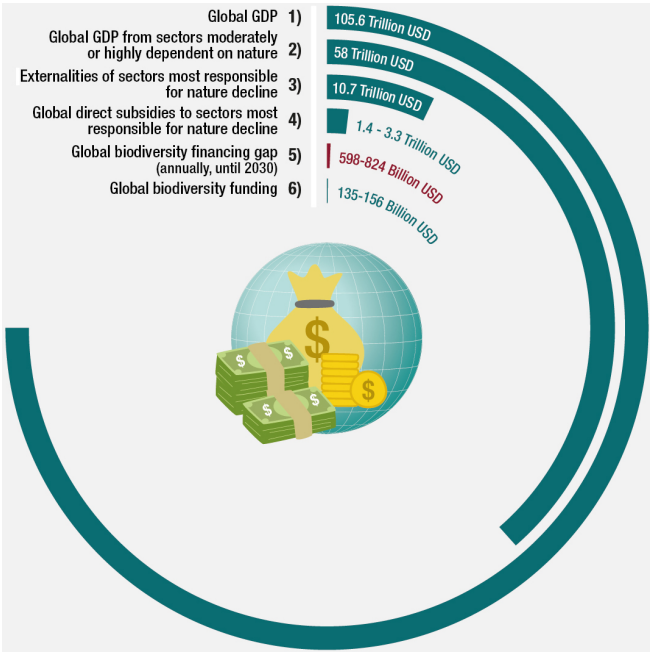
[1]Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain, [2]Institut de Ciència i Tecnologia Ambientals (ICTA) - Universitat Autònoma de Barcelona, Cerdanyola del Vallès, Spain, [3]Departament d'Antropologia Social i Cultural, Universitat Autònoma de Barcelona, Cerdanyola del Vallès, Spain, [4]School of Agriculture and Environment, The University of Western Australia, Perth, Australia, [5]Research Faculty of Agriculture, Hokkaido University, Sapporo, Japan, [6]The Western Australian Biodiversity Science Institute, Perth, Australia, [7]Department of Geography Environment and Geomatics, University of Guelph, Guelph, Canada, [8]School for Environment and Sustainability, University of Michigan, USA, [9]Keough School of Global Affairs, University of Notre Dame, Notre Dame, USA, [10]Instituto de Investigaciones en Recursos Naturales Agroecología y Desarrollo Rural, Universidad Nacional de Río Negro, Río Negro, Argentina, [11]Institute of Geography, University of Bern, Bern, Switzerland, [12]Department of Sociology and Human Geography, University of Oslo, Oslo, Norway, [13]Faculty of Business and Economics, University of Lausanne, Lausanne, Switzerland, [14]EqualSea Lab-CRETUS, Department of Applied Economics, University of Santiago de Compostela, Spain, [15]Oportunius, Xunta de Galicia, Santiago de Compostela, Spain

trillion to US$3.3 trillion annually (Reyes-García et al. 2025). These subsidies artificially lower prices, which encourages overproduction and overconsumption with adverse consequences for nature and the communities who directly depend on it. Between 2020 and 2022, governments provided US$630 billion of environmentally harmful subsidies to producers. Such support not only continues unabated, but it increases in volume. Since 2021, the total public funding of environmentally harmful activities has increased by 55% (UNEP 2023).

Moreover, subsidized economic sectors generate over US$10.7 trillion in environmental externalities annually (Reyes-García et al. 2025). For example, the various costs associated with the extraction of fossil fuels, such as air pollution or degradation of marine ecosystems, are estimated at about US$5.25 trillion annually (Black et al. 2023). A similar situation exists for global agricultural systems, which contribute to deforestation, water scarcity, land degradation, and greenhouse gas emissions, generating an estimated cost of US$3.3 trillion annually (FOLU 2019). Although these figures underscore the magnitude of hidden burdens on nature, it is important to recognize that such estimates involve significant uncertainty, which is often not transparently conveyed in the sources. The calculations depend on methodological assumptions, such as how to value ecosystem services or assess impacts on human health, decisions that are inherently normative and ethically complex. These hidden costs effectively function as implicit subsidies to the economic system, shifting the burden onto nature and society. Over time, they pose escalating risks not only to environmental sustainability but also to the long-term resilience of economic systems (Crona et al. 2021, Dasgupta et al. 2021).

In contrast, efforts to conserve, restore, and sustainably use biodiversity are significantly underfunded. Annual financial disbursements for global biodiversity protection and ecosystem restoration range from US$124 to US$143 billion (equivalent to US$135–156 billion in 2023, adjusting for inflation). By comparison, the estimated annual support needed to sustainably manage biodiversity and maintain ecosystem integrity is between US$722 and US$967 billion per year, leaving a biodiversity financing gap of US$598–824 billion per year (Deutz et al. 2020; Fig. 1). Restoration and regeneration efforts would demand further investment. For instance, implementing Brazil's restoration plan for its three most widespread biomes (Amazon, Cerrado, and Atlantic Forest) is estimated to cost US$0.7–1.2 billion annually until 2030, depending on the extent of natural regeneration (Brancalion et al. 2019). Overall, current funding falls far short of what is required to support biodiversity strategies, even before accounting for restoration needs.

Fig. 1. The economic landscape of global sustainability: interdependencies and funding gaps. The figure illustrates the sharp contrast between economic sectors' dependance (2) and impact (3) on nature, and between public investment in economic sectors driving nature's decline (4) and biodiversity funding (6). Arc lengths are calculated as a share of global GDP in 2023. (1) Global GDP (2023): US$105.6 trillion (Evison et al. 2023). (2) Global GDP moderately or highly dependent on nature (2023): US$58 trillion (Evison et al. 2023). (3) Estimated externalities from sectors most responsible for nature's decline: US$10.1 trillion in 2021, adjusted for inflation to US$10.7 trillion in 2023 (Reyes-García et al. 2025). (4) Estimated global direct subsidies to nature-declining sectors: US$1.3–3.1 trillion in 2021, inflation-adjusted to US$1.4–3.3 trillion in 2023 (Reyes-García et al. 2025). (5) Global biodiversity funding gap: US$598–824 billion annually through 2030 (Deutz et al. 2020). (6) Current global biodiversity conservation financing: estimated at US$124–143 billion, or US$135–156 billion when adjusted to 2023 values (Deutz et al. 2020). Adjustments for inflation were done using the consumer price index.



TRANSFORMING THE ECONOMIC LANDSCAPE FOR GLOBAL SUSTAINABILITY

To address the critical need to bridge the global biodiversity financing gap, some have proposed mobilizing additional economic resources. Target 19 of the Kunming-Montreal Global Biodiversity Framework proposes increasing flows of international and domestic financial resources for biodiversity conservation, including leveraging private finance, stimulating innovative funding schemes, and enhancing collective action to mobilize at least US$200 billion/year by 2030. Similar mechanisms have been proposed by the United Nations Environment Programme to maximize the potential of nature-based solutions. Financial and economic instruments, such as Payments for Ecosystem Services, taxes, subsidies, and tradable permits, and mechanisms aimed at compensating for the additional costs of biodiversity conservation (e.g., Reducing Emissions from Deforestation and Forest Degradation [REDD+] and EU agri-environmental schemes), are designed to guide economic decisions through price signals. But, to date, these instruments have not found adoption at a scale commensurate to the challenge of biodiversity conservation. In the cases where they have been adopted, their impact has been limited and with mixed outcomes (van Oorschot et al. 2020).

Moreover, simply addressing the global biodiversity financing gap with additional resources will not tackle the underlying causes of biodiversity loss. National governments and international organizations (e.g., World Trade Organization) have called for the urgent elimination, phasing out, or reform of current subsidies to economic sectors responsible for nature's decline and biodiversity loss. Their call for rethinking environmentally harmful subsidies is echoed in many internationally adopted instruments (e.g., Kunming-Montreal Global Biodiversity Framework, Paris Agreement, 2030 Agenda for Sustainable Development). Although it is argued that subsidies reform might release substantial financial resources to implement the sustainability agenda, uptake has been limited (Dempsey et al. 2020, Matthews and Karousakis 2022) and current levels of ambition fall short of meeting the challenge (Reyes-García et al. 2025). Target 18 of the Kunming-Montreal Global Biodiversity Framework aims to reduce harmful incentives by at least US$500 billion/year, a target still distant from the current level of subsidies (US$1.4 to US$3.3 trillion/year). Reforming subsidies is a complex challenge that involves changes in governance (e.g., tackling powerful lobby groups that benefit from the status quo) and plans to minimize the potential fallout of subsidy reforms (e.g., gradually removing support to agriculture does disproportionally impact vulnerable groups; Matthews and Karousakis 2022).

Furthermore, restructuring subsidies to economic sectors does not address the underlying root causes of biodiversity loss either and tackling the biodiversity crisis demands even deeper transformations of the economic system (IPBES 2024). Economic and financial systems are inextricably embedded and, therefore, limited by the natural world (Dasgupta 2021). Because economic activities are significantly coupled with environmental pressures, a selective downscaling of production and consumption has been proposed as a transition strategy to lower the overall ecological footprint of our economic system (Kallis et al. 2018, Hickel et al. 2022). A diversity of instruments ranging from production quotas and progressive consumption taxes to anti-speculation financial instruments and restructuring of global debts have been proposed as part of generating finance to protect and conserve biodiversity and nature (Fitzpatrick et al. 2022). Moreover, because the value of nature extends well beyond its market price, applying economic policies in isolation can reinforce the very instrumental values that enable the extractive practices that cause biodiversity loss and nature's decline (Pascual et al. 2023). Monetary metrics alone are insufficient to capture the multiple values of nature. Complementary measures, such as ecological integrity, cultural significance, and lived experiences of loss, are critical for informing just and effective biodiversity policy (Termansen et al. 2022). Relying solely on monetary indicators risks reinforcing the narrow value framings that contributed to the crisis in the first place. To be effective, these economic interventions need to be integrated within a broader strategy aiming at transforming the overall governance systems (IPBES 2024).

The current economic system is incompatible with the 2050 vision of living in harmony with nature. Although closing the biodiversity funding gap and restructuring subsidies to economic activities, two options currently considered by several national governments, international organizations, and internationally adopted instruments, are critical transition steps, they fail to address the underlying causes of nature decline. Securing a future where human well-being coexists with ecological integrity requires aligning economic flows within these limits.

Author Contributions:

VRG and RP are equal first authors.
Conceptualization: VRG, RP
Methodology: VRG, RP, LG
Investigation: VRG, RP, KB, CIS, TP, SV
Visualization: VRG, LG, SV
Funding acquisition: VRG
Writing – original draft: VRG, RP
Writing – review & editing: LG, KB, AA, CIS, KO, TP, SV

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Data Availability:

Datalcode sharing is not applicable to this article because data comes from secondary sources referenced in the article.

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