



UN DECADE ON ECOSYSTEM RESTORATION

POLICY ARTICLE

Natural capital approaches: shifting the UN Decade on Ecosystem Restoration from aspiration to reality

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The UN Decade on Ecosystem Restoration offers a vital opportunity to advance scaled-up, integrated approaches that reverse ecosystem degradation, biodiversity loss, and climate disruption and deterioration. Combining tools across disciplines is essential to addressing these interwoven, global crises through inclusive, equitable strategies with demonstrable socio-economic benefits. Tools and initiatives described here, including the EcoHealth Network, the System of Environmental Economic Accounting Ecosystem Accounting and its application through the INCASE project in Ireland, and the Natural Capital Project, present ready-made approaches to engage with policymakers and stakeholders in a transparent way. These examples are working to yield accurate indicators revealing the true costs and benefits of restoration policies and projects in both environmental and social terms. We highlight that collaborative efforts, particularly engagement between ecologists, economists, and other stakeholders, are essential to inform the ongoing development of fit-for-purpose natural capital approaches, and that synergies between natural capital and restoration approaches can be further strengthened to raise awareness of, and progress, restoration projects on the scale the UN Decade on Ecosystem Restoration envisages. We also reflect on the term “natural capital,” which is often misunderstood as implying that monetary metrics should take preference over non-monetary arguments or considerations, thereby presenting a barrier to engagement for some ecologists, environmentalists, and stakeholders. Natural capital approaches offer us opportunities to track and support the necessary changes to expand and embed the culture of restoration into decision-making across sectors, highlighting multiple benefits for society and economy.

Key words: accounting for nature, ecosystem restoration frameworks, ecosystem services, natural capital, transdisciplinary approaches

Implications for Practice

- Natural capital approaches offer a transdisciplinary language, facilitating cooperation between academics and decision-makers, across rural communities, governments, and business sectors.
- Aligned with established decision-making frameworks, these approaches reveal the dependence of economic and social systems on ecosystems, and the multiple services they provide.
- Natural capital accounting in particular presents considerable scope for synergy with ecosystem restoration frameworks, enabling prioritization of restoration targets while tracking their outcomes.
- Framing ecosystem restoration through natural capital approaches can create policy impetus for the adoption of scaled-up restoration projects to support the UN Decade on Ecosystem Restoration.
- While challenges remain, natural capital approaches are effective tools that drive investment to deliver mutual benefits across an array of multilateral environmental agreements.

The UN Decade of Ecosystem Restoration: Time to Restore

Natural ecosystems are essential to sustainable development, poverty alleviation, and improved human well-being, thereby underpinning the United Nations Sustainable Development

Author contributions: CAF coordinated contributions/outlined content; PW led writing of Box 1; JA wrote content on EcoHealth Network; CO, LH wrote content on UN SEEA EA; GCD wrote content on Nat Cap Project; CAF, JCS wrote content on INCASE; all authors contributed to editing the manuscript.

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doi: 10.1111/rec.13613

Goals (SDGs) (UN 2019). However, the long-term degradation of ecosystems coupled with loss of their biodiversity and functional processes, including climate regulation, present immediate challenges, and existential threats to achieving these goals (Steffen et al. 2015; Díaz et al. 2019; IPCC 2021). Repeated calls have been made to urgently address these global issues, which require both transformational behavior and the integration of tools across social, environmental, and economic disciplines (Dasgupta 2021).

The UN Decade on Ecosystem Restoration, 2021–2030, builds on an array of keystone UN multilateral agreements (UNFCCC, CBD, UNCCD, UN SDGs). It aims to support and scale-up efforts to prevent, halt, and reverse the degradation of ecosystems worldwide, while simultaneously raising awareness of the importance of successful ecosystem restoration in terms of achieving the broader suite of SDGs (UN 2019).

While this initiative is both welcome and essential, the Decade faces serious challenges. Paramount among them are setting science-based restoration targets and measuring the return-on-investment of restoration to society, at the range, scale and pace required. These challenges are further underlined given that restoration—a crucially important conservation and climate strategy—is still poorly understood in any depth by policy makers, often failing to engage stakeholders and the general public. There is still much work to be done and a limited time-frame to do so. We argue that natural capital approaches can play a major role in addressing these challenges.

Integrating Tools Across Disciplines

While a number of frameworks have been developed to support restoration, such as the *SER International Principles and Standards* developed by the Society of Ecological Restoration (Gann et al. 2019), we also need policies to support necessary investment in restoration. However, we cannot justify, design, implement, monitor, assess, and adjust policies aimed at restoring ecosystems at the required level of investment, without first reaching a shared understanding of how ecosystems support economic activity and human well-being. To do this, we need to connect the various frameworks and tools that integrate nature, economy, and society.

Since its origins in the last century (Missemer 2018), the concept of “natural capital” has been applied in complementary ways by different groups. A number of natural capital approaches, in development since the 1990s, share the common aims to reveal the interwoven connections between environment, society, and economics, making impacts and dependencies between nature and economy explicit (Hein et al. 2020a). Integrating advances in science and ecosystem services assessment, these approaches have delivered effective tools that drive investment to deliver mutual benefits across an array of multilateral environmental agreements; and they can support the realization of restoration goals under the UN Decade on Ecosystem Restoration (UN 2019).

In this paper, we present examples of natural capital approaches developed through networks and projects that have the multi-sectoral perspective required to deliver successful ecosystem restoration, highlighting the integral role of trans- and

multidisciplinary efforts. The case studies and examples presented include:

- (1) The EcoHealth Network: an initiative with its roots in ecological restoration, highlighting the mutual and self-reinforcing benefits of ecological and human health.
- (2) The UN System of Environmental Economic Accounting (SEEA EA): a highly organized, standardized ecosystem accounting framework designed to support a statistical approach to align with existing economic reporting frameworks.
- (3) The Natural Capital Project (NatCap): a highly effective global partnership (rooted in ecological sciences) developed to improve the well-being of people by motivating targeted investments in nature through ecosystem restoration and other nature-based solutions.
- (4) The INCASE project, developed in Ireland to pilot natural capital accounting at river catchment scale, highlighting the role of scientists and stakeholder collaboration as critical process steps.

Through these examples, we show that collaborative efforts, particularly engagement between ecologists, economists, and other stakeholders, are essential to inform fit-for-purpose natural capital approaches. We also reflect on the phrase “natural capital” (Box 1) often misunderstood as implying that monetary metrics should take preference over non-monetary arguments and thereby presenting a barrier to engagement for some ecologists, environmentalists, and stakeholders.

The EcoHealth Network

In 2007, a group of natural scientists, economists, foresters, planners, and social scientists from around the world came together to articulate a conceptual and actionable framework concerning Restoring Natural Capital (RNC). The resultant RNC Alliance defined RNC as a process consisting of four elements, namely:

- (1) Ecological restoration and rehabilitation of degraded ecosystems, both natural and cultural.
- (2) Reduction of the negative impacts of production systems.
- (3) Reduction of the negative impacts of cities, resource extraction, and transport.
- (4) The promotion of education, communication, and outreach to increase awareness of the importance of natural capital and ecosystem services in the everyday lives of human society (Aronson et al. 2007).

Out of the RNC framework grew the concept of a “family of restorative activities” (Aronson et al. 2017), an essential framing for the restoration (no matter what scale) that is necessary to achieve targets like those set under the UN Decade on Ecosystem Restoration. In a nutshell, these activities fall into six broad categories among which choices are made in the context of any given restoration site and/or project, ranging from the restoration of historic ecosystems to regenerative agriculture. The activities reinforce the knowledge that there is no “one size fits all” in ecological restoration and align with and support the

Box 1 Natural capital—language matters

Natural capital approaches and the concept of ecosystem services highlight the profound links between nature and culture, including human economies and all forms of community and society. They also enable us to view the economy and society as nested within the natural world and, through a combination of ecology and numerous other natural sciences, support ecologically aware economics (Dasgupta 2021). However, the concept has not always been welcomed within environmentalist communities. Here we address two of the criticisms that it sometimes evokes, which we believe are based on misconceptions.

Misconception 1: The natural capital concept puts nature up for sale

This misconception is based on the impression that natural capital is simply a synonym for “natural resources,” which can be bought and sold, and that the concept contributes to continuing the crude commodification of nature. On the contrary, natural capital, as we use the phrase, underpins the supply of a wide array of ecosystem services. These include cultural, esthetic, and spiritual relationships with the natural world—integral aspects of human experience. These relationships, and the values thereof, do not easily translate into monetary terms, but should nonetheless be integrated systematically into decision-making. We note, however, that while some argue “nature is not for sale,” the degradation of nature has arisen through failure, reflected in mainstream economics, to recognize the values of vital life-support and life-fulfilling services that ecosystems provide. Natural capital approaches shine a light on these many values of nature, in biophysical, social, health, and economic terms. Some of these can be brought onto the economic balance sheet in meaningful ways, so that nature counts in cost–benefit and other decision frameworks that prevail today. While we work toward a deep cultural shift that recognizes nature’s values fully, we must take initial steps to include some of these values albeit within “less than perfect” existing systems. The economy is a subset of the environment, not vice versa, and this insight drives us to value and restore natural capital and the myriad ecosystem services it underpins.

Misconception 2: The natural capital concept implies support for specific economic systems

Many people, in good faith, wrongly assume that the natural capital concept is identified exclusively with capitalist ideology (Sullivan 2017). As we use the phrase, natural capital, like other forms of capital, yields a flow of benefits that is necessary to all members of society, and all social systems. The question of who controls capital is important but entirely separate. Natural capital approaches such as ecosystem accounting tools can contribute to a just society by greatly increasing the transparency of natural capital use, provided that spatially explicit, regularly updated natural capital accounts are made accessible and actionable. The accounts can illustrate, for example, how different ecosystem services accrue to different types of users, illuminating potential trade-offs involved, and providing guidance to public policymaking in relation to ecosystem management and restoration. As summarized by Schumacher, “Far larger is the capital provided by nature and not by man—and we do not even recognise it as such. This larger part is now being used up at an alarming rate, and that is why it is an absurd and suicidal error to believe, and act on the belief, that the problem of production has been solved Let us take a closer look at this ‘natural capital’” (Schumacher 1973).

Restorative Continuum as outlined in the SER *International Principles and Standards* (Gann et al. 2019).

Building on the foundational and influential work of the RNC Alliance, members of the original group are now working alongside scholars and practitioners from an array of disciplines (from economics to geography, urban and landscape design, and engineering to medicine and public health), as well as local communities, under the banner of the EcoHealth Network to further develop the understanding and practice of ecological restoration as mutually beneficial and self-reinforcing for both ecosystem and human health. This “network of networks” is highlighting the links and synergies between actions toward both the UN Decade on Ecosystem Restoration and UN Decade for Action on the SDGs. The global EcoHealth Network is young but gathering momentum and there are member sites and hubs, and nascent regional networks, providing case studies, meeting places, and training centers, each bringing their own learnings while highlighting the need for integrated approaches to move both

ecosystem restoration and human health agendas forward together (Bradby et al. 2021).

The System of Environmental Economic Accounting—Ecosystem Accounting

The SEEA EA, in development since 2010, is part of a broader initiative to systematically record the relationship between the environment and the economy, including the derivation of measures of environmental degradation and restoration (UNSD 2021). Coordinated by the UN Statistics Division and developed through the collaboration of statistical offices, economists, and scientists worldwide, it has gained prominence as a broadly accepted conceptual and methodological framework to record and analyze human use of ecosystems, now tested in some 40 countries (Hein et al. 2020a).

The SEEA EA framework is spatially explicit, designed to track changes in ecosystems over time in a standardized manner, across four key areas (extent and type, condition, services, and

benefits). A key feature of the SEEA EA is that, since its conception, it has been designed to align with the System of National Accounts. This allows for compiling accounting information concerning ecosystem stocks and flows that can be reported alongside standard economic data and enables the derivation of environmentally adjusted measures of, for example, gross domestic product (GDP) and national wealth (Obst 2015). Designed to be applied at varying scales (site level to national), the SEEA EA accounts highlight degradation and loss of ecosystems, as well as the associated losses in ecosystem services and the resulting economic impacts (Obst et al. 2016). Applying the SEEA EA framework has led to direct policy changes, for example, to implement measures to reduce greenhouse gas emissions from drained peat soils in the Netherlands (Hein et al. 2020b) and to guide corporate bodies in how best to manage their assets to secure a wider range of environmental benefits (Dasgupta 2021).

While restoration planning is not always the direct focus of the SEEA EA, the accounts can assist in prioritizing locations where ecological restoration would yield greatest benefits (Farrell et al. *in review*), as well as identifying locations where analysis indicates future issues may emerge around sustainable development (e.g. areas having increasing urbanization). Ecological knowledge and data are fundamental to ensure that the SEEA EA results are fit for purpose (i.e. they are relevant for each ecosystem type) and that they reflect the complexity of natural systems. This complexity emphasized by Bateman and Mace (2020) needs to be incorporated into measures of ecosystems' extent and type, changes in their condition, in the selection of appropriate reference levels (in local and regional contexts), in measuring the bundles of services (both those already included and those heretofore un-recognized) they deliver, and in accounting for the interactions between ecosystems (UNSD 2021). Ecological knowledge is also required to ensure that restoration efforts are focused on restoring ecosystem health and resilience, both of which can serve to address climate and biodiversity targets, while at the same time ensuring unintended biodiversity losses through ill-informed practices are avoided.

The Natural Capital Project: Science, Technology, and Partnerships That Enable People and Nature to Thrive

The Natural Capital Project (NatCap) aims to transform decision-making paradigms, so that nature is recognized as a core engine of prosperity and vital focus of investment. Building on the foundational work of the RNC Alliance and the UN SEEA EA, NatCap is advancing a systematic and pragmatic approach to valuing nature in planning, policy, finance, and day-to-day practice. Operating as a global partnership, NatCap now includes 300 research and implementing institutions. Collectively they are pioneering:

- (1) New science quantifying the contributions of natural capital to resilience and security in vital dimensions of well-being, including climate, energy, nutrition, water, health, and livelihoods.
- (2) The free and open-source Natural Capital Data and Software Platform, which makes the science accessible and actionable to communities worldwide, to inform decisions. The Platform's InVEST software is now used in over 185 countries, mostly at regional and country scales, and for global modeling by IPBES (Chaplin-Kramer et al. 2019). Using new fine-scale data streams, NatCap recently launched Urban InVEST (Hamel et al. 2021).
- (3) Demonstrations of green and inclusive development pathways, with investments in both ecosystem stewards and in restoration at their heart, in diverse geographies and sectors worldwide (Mandle et al. 2019).

The ultimate aim of NatCap is to improve the well-being of all people and nature by motivating greater and more targeted investments in ecosystem conservation and restoration, and work to date has covered a wide array of places and sectors. There is, however, an urgent need to scale up these demonstrations, through a number of means including: greater financial transfers, such as from downstream beneficiaries to upstream ecosystem stewards; nature positive forms of development planning and assistance; and new global standards and norms. NatCap approaches have recently been standardized in climate resilience planning across the Caribbean (through the InterAmerican Development Bank), and in zoning 50% of land area, and paying 200 million ecosystem stewards therein, for securing ecosystem service flows in China (Mandle et al. 2019). These investments are increasingly coordinated using Gross Ecosystem Product (GEP; Ouyang et al. 2020), an accounting aggregate now defined in approach based on the SEEA EA framework and recognized in 2021 by the United Nations Statistical Commission as a tool that can be aligned with the SEEA EA (UNSD 2021).

INCASE: Irish Natural Capital Accounting for Sustainable Environments

This is a case study of the application of natural capital accounting in Ireland. The 2014 establishment of the Irish Forum on Natural Capital (now Natural Capital Ireland, NCI) created a platform where ecologists, policy makers, business leaders, and NGOs could engage in discussions around natural capital concepts and approaches. While natural capital accounting had been trialed in Ireland at company level (e.g. by peat extraction and commercial forest enterprises), in 2019 NCI members took the first steps to develop a multidisciplinary project (INCASE) with the purpose of applying the SEEA EA at catchment scale (Farrell et al. 2021).

Stakeholder engagement undertaken as part of INCASE has cut across a range of governmental departments (including the agriculture, forestry, nature, and marine sectors), environment agencies, corporate bodies, and local groups. This has revealed a demand for a standardized means to integrate nature into decision-making, particularly to elucidate business impacts and dependencies relating to agricultural and bioeconomy production systems. Integration of transparent mechanisms such as the SEEA EA could assist in the implementation of EU regulatory frameworks such as those relating to climate, water, and biodiversity (Farrell et al. 2021), often resisted because their

benefits have not been demonstrated to affected stakeholders who bear their costs.

INCASE has highlighted the need for tailored approaches to data gathering to frame the accounts in the necessary context, and for communicating the outputs into higher-level changes in policy. The input of ecological knowledge and guidance has also been shown to be essential for the establishment of national reference levels for each ecosystem type—a key aspect of the three-stage condition accounting process outlined in the SEEA EA (UNSD 2021). In the absence of relevant condition data, tools such as the SER Restorative Continuum (Gann et al. 2019) have proven useful to indicate trends in ecosystem recovery and/or degradation, as a basis to direct targets for restoration. For example, by assessing areas where pressures have been reduced (removal of livestock) and where active restoration has been undertaken (such as revegetation measures), the stages and direction of trends in ecosystem recovery of upland peatlands degraded by overgrazing can be aligned with the SER Restorative Continuum as a proxy for ecosystem condition (Farrell et al. *in review*).

Finding the Common Ground: Integrating Restoration and Natural Capital Approaches

Each of these natural capital approaches plays a different role within the natural capital space. Commonalities include multidisciplinary approaches, stakeholder engagement, making explicit the links between nature and the economy, the essential role of ecology to guide natural capital accounting, and the necessity of sound scientific methods. While there are differences in terms of end-user perspective, whether in terms of physical area (catchment vs. national scale), public or private perspective (state, corporate or community), and/or structure (partnership or network vs. statistical standard), the natural capital approaches presented here have demonstrated through practice and application that they can be used to effect better decision-making, informing, and guiding policy changes to realize societal goals.

While challenges remain and there is a limited number of examples where natural capital accounts have been used to influence and direct policy (Hein et al. 2020a), momentum is growing. The examples described here serve to demonstrate the latent potential of natural capital approaches and inspire further interest and collaboration. Reflecting the knowledge that in restoration there is no “one size fits all,” natural capital approaches must be tailored to support restoration as needs require. Working collaboratively is vital if we are to set and achieve the UN Decade’s targets in this critical time. Building on common ground is a good starting point and the scope for synergy includes:

- (1) The potential for ecosystem accounting to guide restoration targets and track results and/or monitoring (through the SEEA EA accounting framework) (Vysna et al. 2021).
- (2) The central role of iterative stakeholder engagement in natural capital approaches, also outlined as Principle 1 of the *SER Standards* (Gann et al. 2019).
- (3) The integral links between ecological and human health (highlighted through the work of the EcoHealth Network).

In conclusion, natural capital approaches can support setting and achieving credible restoration targets, while tracking restoration outcomes, for nature, society, and economy; helping to transform this UN Decade on Ecosystem Restoration from an aspiration to a reality.

Acknowledgments

The authors thank the editors of *Restoration Ecology* and one anonymous reviewer, for their helpful comments on the manuscript and submission process. The authors also thank colleagues A. Cross, N. Goodwin, and D. Cargalanan for their inputs and suggestions. The INCASE (Irish Natural Capital Accounting for Sustainable Environments) project is funded under the EPA Research Programme 2014–2020, a Government of Ireland initiative funded by the Department of the Environment, Climate and Communications. It is administered by the Environmental Protection Agency, which has the statutory function of coordinating and promoting environmental research, www.incaseproject.com.

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Coordinating Editor: Stephen Murphy

Received: 3 November, 2021; First decision: 26 November, 2021; Revised: 30 November, 2021; Accepted: 30 November, 2021