United Nations University
Institute for Environment and Human Security

PEDRR
Ecosystems for Disaster Risk Reduction and Adaptation

POLICYBRIEF
No. 15, 2024

Ecosystem-based approaches for integrating disaster risk reduction, climate, land and biodiversity goals

Yvonne Walz, Lisa Hartmann, Sally Janzen, Jack O'Connor, Fabian Rackelmann, Marisol Estrella, Chawanangwa Nyirenda, Sandra Amlang, Kristin Meyer, Iria Touzon Calle, Veronica Ruiz Garcia, Dorsa Sheikholeslami, Jeroen Jurriens, Heidi Tuhkanen, Irfan Maqbool, Nidhi Nagabhatla, Johann Georg Goldammer, Nathalie Doswald, Karen Sudmeier-Rieux

Key recommendations

Leverage ecosystem-based approaches as entry points to align policy objectives and address multiple goals of the Rio Conventions and the Sendai Framework simultaneously and effectively

Ecosystem-based approaches can contribute to the specific goals of the Rio Conventions and the Sendai Framework for Disaster Risk Reduction (hereafter Sendai Framework). Each Convention has certain goals, targets, tools and processes where ecosystem-based approaches could be emphasized, and their use has been explicitly encouraged in specific targets and decisions related to the Rio Conventions and the Sendai Framework. There is a need for enhanced collaboration among the Rio Conventions and the disaster risk reduction community, to align existing policies and frameworks across sectors and to mainstream multi-goal-oriented, ecosystem-based approaches in national and local-level policy and planning. This can significantly reduce programme costs and increase effectiveness at the same time.

Promote and apply integrated spatial planning tools

Ecosystem-based approaches are inherently "place-based", meaning that they are implemented within specific geographic areas or landscapes. A forward-looking strategy to address multiple goals using ecosystem-based approaches in strategic and project-based development planning involves applying integrated spatial planning tools, which can be used in terrestrial, inland water, coastal and marine ecosystems. Geospatial data (on disaster risks, ecosystem health, vulnerability, exposure and impacts) enable the use of indicators to track progress under the different Conventions and the Sendai Framework. Such data can also support more transparent and inclusive decision-making processes, by recognizing and integrating diverse knowledge systems, including Indigenous and local knowledge.

Bring science on board to plan and implement multi-goal-oriented, ecosystem-based approaches

Scientific evidence has shown that ecosystem-based approaches can be implemented more efficiently when integrating multiple goals and objectives (for example, disaster risk reduction and biodiversity conservation). This can avoid unintended consequences such as reduced water availability, changes in the composition of biodiversity and adverse livelihood outcomes. Multi-hazard risk assessments and scenario planning, and collaborations such as the Science Based Targets Initiative, can ensure that actions are targeted and that they consider the potential trade-offs between multiple goals. Research efforts to address data gaps and

Abbreviations

CBD	Convention on Biological Diversity
CCA	Climate change adaptation
DRR	Disaster Risk Reduction
ICZM	Integrated coastal zone management
ILUP	Integrated land-use planning
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
LDN	Land degradation neutrality
NAP	National Adaptation Plan
NbS	Nature-based solutions
NBSAP	National Biodiversity Strategies and Action Plans
NDC	Nationally Determined Contributions
PEDRR	Partnership for Environment and Disaster Risk Reduction
SDGs	Sustainable Development Goals
UNCCD	United Nations Convention to Combat Desertification
UNDRR	United Nations Office for Disaster Risk Reduction
UNEA	United Nations Environment Assembly
UNFCCC	United Nations Framework Convention on Climate Change
UNU-EHS	United Nations University Institute for Environment and Human Security

develop collection and analysis of spatial data need to be boosted, to better inform policy, planning and financing of monitoring and reporting for climate- and disaster-related loss and damages, which cut across the different Conventions.

Leverage diverse financing opportunities for achieving multiple goals simultaneously

Multi-goal-oriented, ecosystem-based approaches have the potential to increase recognition of the diversity of ecosystem services, whose provision is enhanced by ecosystem-based approaches. More concerted effort on the valuation of these diverse services could open new access to multiple funding opportunities, such as the Global Environment Facility, Green Climate Fund, Adaptation Fund and funds responding to loss and damage. Greater attention is needed to ensure that these funds and other financing mechanisms focusing on climate and ecosystems also reach those who are most vulnerable. They must prioritize those most in need and at risk, including migrants, women and people with disabilities, while leaving no one behind.

It is a positive development that there has been a significant increase in private financing for nature, including ecosystem-based approaches, in recent years. Opportunities to integrate both ecosystem-based approaches and resilience building into private sector financing include harnessing biodiversity credits, using Payments for Ecosystem Services in carbon and restoration, and influencing supply chains related to forestry, agriculture and sustainable fisheries. Nevertheless, there is still a strong need to create incentives and demonstrate equitable use cases for investing in ecosystem-based approaches to enhance climate and disaster resilience. Leveraging such diverse funding streams is key to meeting the capacity-building needs of governments and other stakeholders leading the implementation of ecosystem-based approaches.

The Partnership for Environment and Disaster Risk Reduction (PEDRR), formally established in 2008, is a global alliance of United Nations agencies and intergovernmental and non-governmental organizations that promote the scaling up of ecosystem-based approaches for disaster risk reduction (DRR) and climate resilience. In this regard, PEDRR advocates for leveraging synergies between the three Rio Conventions – the Convention on Biological Diversity (CBD), the United Nations Convention to Combat Desertification (UNCCD) and the United Nations Framework Convention on Climate Change (UNFCCC) – and the Sendai Framework.

This policy brief discusses common goals, shared challenges and a way forward on how ecosystem-based approaches can create a bridge between the specific national planning instruments in place. The aim is to meet national priorities and the Sustainable Development Goals (SDGs), by simultaneously addressing multiple goals and targets of the respective Conventions and frameworks. Ecosystem-based approaches refer to integrated and adaptive management strategies inspired and supported by nature that promote conservation and the sustainable and equitable use of land, water and living resources (Estrella and Saalismaa, 2013; CBD, 2024). These science-based approaches use ecosystems as entry points to achieve multiple specific goals. The Rio Conventions and the Sendai Framework often use the term “ecosystem-based approaches” to describe a specific subset of nature-based solutions (NbS), explaining for example that ecosystem-based adaptation is a nature-based solution for climate change adaptation and mitigation (UNFCCC, n.d.; UNDRR, 2020).

This brief aims to inform national focal points for the Rio Conventions and the Sendai Framework and other relevant national and international actors about the role of ecosystem-based approaches and how they can connect these global agendas at the country level. This is highly topical, as 2024 marks a pivotal moment in international policy discussions within intergovernmental sessions for all three Rio Conventions and upcoming Global and Regional Platforms on DRR. The policy brief demonstrates entry points for scaling up actions for implementation through integrated planning, which involves coordinating various sectors and stakeholders,

and leveraging data and finance for multi-goal-oriented, ecosystem-based approaches at the landscape scale.

The Rio Conventions and the Sendai Framework for Disaster Risk Reduction: common goals and shared challenges

The three Rio Conventions and the Sendai Framework address key global goals: biodiversity conservation (CBD), combating desertification, land degradation and drought (UNCCD), climate change mitigation and adaptation (UNFCCC) and disaster risk reduction (Sendai Framework). The Rio Conventions were established in 1992 with the aim of integrating environmental and development concerns through a more in-depth understanding and targeted action on their specific goals to stabilize greenhouse gas concentrations in the atmosphere, to manage land sustainably, and to conserve and protect biodiversity (UNSD, 1992). Recognizing the increasing frequency and severity of disasters worldwide, the Member States of the United Nations subsequently adopted the Sendai Framework for Disaster Risk Reduction (Sendai Framework) in 2015. The Rio Conventions and the Sendai Framework share the goal of promoting a system that prioritizes planetary health and human well-being, which is directly in line with the SDGs. They aim to guide countries towards sustainable consumption of natural resources, equality and social justice.

In pursuit of their goals, the Rio Conventions and the Sendai Framework each tackle global environmental challenges. Climate change, biodiversity loss and pollution are currently at the centre of global attention, as this "triple planetary crisis" is driving more complex and cascading risks, compromising food, water, energy and health systems (Passarelli et al., 2021; UNFCCC, 2022). Meanwhile, the degradation of ecosystems, driven mainly by land conversion and resource exploitation, is accelerating at an alarming rate (Olsson et al., 2019). These adverse trends influence each other. For example, climate change drives desertification due to increasing temperatures and changing rainfall patterns, and consequently biodiversity loss due to shifting ecological boundaries. It also intensifies the frequency and severity of extreme weather events, which results in significant economic and non-economic losses, including displacement and loss of productive land and biodiversity (UNFCCC, 2018).

The compounding effects of these major global challenges further contribute to changes in the composition, structure, function and health of ecosystems (IPBES, 2019). The declining health of ecosystems reduces their inherent ability to provide services essential for ecological functionality, human well-being and security (IPCC, 2022). The deterioration of ecosystem services creates feedback that exacerbates the drivers of global challenges (IPCC, 2019; IPBES, 2018; Pörtner et al., 2021; Reichhuber et al., 2019). For example, climate change drives more extreme weather events such as droughts, which adversely impact vegetation conditions and reduce gross net primary productivity. In turn, this reduces not only habitats that support biodiversity, but also carbon uptake and sequestration by terrestrial ecosystems, limiting their capacity to contribute to climate change mitigation and adaptation, and making them more vulnerable to future shocks (Yuan et al., 2016; Pereira et al., 2007).

Despite the well-recognized interconnectedness of these shared challenges, the Rio Conventions and the Sendai Framework tend to address them as separate or distinct agendas. Although they are linked to national and subnational development frameworks, they are often not integrated coherently. Siloed approaches make it difficult for countries to implement national commitments while navigating multiple global agendas effectively. In particular, Small Island Developing States, Least Developed Countries and conflict-affected nations face significant challenges in fulfilling their commitments to the Conventions due to limited resources and increasing environmental and humanitarian demands.

Bridging the Rio Conventions and the Sendai Framework through multi-goal-oriented, ecosystem-based approaches

One lever for breaking silos and bridging efforts under the Rio Conventions and the Sendai Framework is through implementing ecosystem-based approaches. There is a growing body of evidence showing that ecosystem-based approaches can act as a "connector" across multiple global agendas, including the SDGs. A scientific report has detailed how approaches such as ecosystem-based adaptation, sustainable land management and ecosystem-based disaster risk reduction can simultaneously achieve various development objectives, such as food and water security, carbon sequestration, biodiversity conservation, climate change adaptation and disaster risk reduction (Walz et al., 2021).

The important role and potential of ecosystem-based approaches is increasingly being recognized, which is why the Rio Conventions and the Sendai Framework have adopted resolutions, decisions, goals and targets that include these approaches, as shown in **Table 1**.

In addition to this broader recognition and inclusion of ecosystem-based approaches, each Convention and framework has developed specific, national-level instruments to help countries achieve their goals, in which ecosystem-based approaches can be emphasized and further contextualized, as shown in **Figure 1** and **Table 2**. These include National Biodiversity Strategies and Action Plans (NBSAPs) under the CBD, National Action Plans, Land Degradation Neutrality (LDN) targets and National Drought Plans under the UNCCD, National Adaptation Plans (NAPs) and Nationally Determined Contributions (NDCs) under the UNFCCC, and local and national disaster risk reduction strategies and plans under the Sendai Framework.

Table 1: Overview of resolutions, decisions, goals and targets related to ecosystem-based approaches (including NbS)

Convention or Framework	Selected goals, targets and decisions related to ecosystem-based approaches
CBD	**Kunming-Montreal Global Biodiversity Framework** • Target 8: Minimize the Impacts of Climate Change on Biodiversity and Build Resilience "through … disaster risk reduction actions, including through nature-based solutions and/or **ecosystem-based approaches**" • Target 11: Restore, Maintain and Enhance Nature's Contributions to People "through nature-based solutions and/or **ecosystem-based approaches**" **Decision XII/20 of CBD COP12** on biodiversity, climate change and disaster risk reduction: "governments and relevant organizations to promote and implement **ecosystem-based approaches** to climate change related activities and disaster risk reduction"
UNCCD	**UNCCD 2018–2030 Strategic Framework** • Para. 5, Strategic objective 1: "To improve the condition of affected ecosystems, combat desertification/land degradation, promote sustainable land management and contribute to land degradation neutrality" • Para. 9 (j): "Implement restoration and rehabilitation practices in order to assist with the recovery of ecosystem functions and services" **Decision 8/COP.15**: "explore complementarities within relevant Multilateral Environmental Agreements, within their respective mandates and goals, in the achievement of the objectives of the United Nations Convention to Combat Desertification at the national level, including, as appropriate, in the implementation of sustainable land management, **ecosystem-based approaches** or nature-based solutions"
UNFCCC	**Paris Agreement** • Article 5 (1): "conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases … including forests" • Article 7 (9e): "building … resilience … through … sustainable management of natural resources" **Sharm el-Sheikh Implementation Plan**, para. 48: "Encourages Parties to consider, as appropriate, nature-based solutions or **ecosystem-based approaches** … for their mitigation and adaptation action"
Sendai Framework	**Sendai Framework for Disaster Risk Reduction** • Para. 28 (d): "To promote transboundary cooperation to enable policy and planning for the implementation of **ecosystem-based approaches** with regard to shared resources" • Para. 30 (n): "To strengthen the sustainable use and management of ecosystems and implement integrated environmental and natural resource management approaches that incorporate disaster risk reduction" Political declaration of the high-level meeting on the midterm review of the Sendai Framework (**A/RES/77/289**), para 26 (g): "Promoting nature-based solutions, **ecosystem-based approaches** … for disaster risk reduction at all levels"

Mainstreaming ecosystem-based approaches in national and community-level planning instruments and policies can ensure sustainable development and poverty alleviation. At the same time, synchronizing and channelling countries' efforts to contribute to the Conventions and the Sendai Framework through the implementation of multi-goal-oriented, ecosystem-based approaches has proven to reduce programme costs and increase effectiveness (**Box 1**).

Several initiatives already place ecosystem-based approaches at the centre of leveraging synergies to address multiple goals. Examples are: (a) the toolkit on NbS for comprehensive disaster and climate risk management (UNDRR and UNU-EHS, 2023; Walz et al., 2023), which guides the development of integrated plans through inclusive governance and stakeholder engagement across planning scales and planning elements, with emphasis on integrating NbS; (b) the guidance on promoting synergies between land degradation neutrality and climate change adaptation, which elaborates how to integrate tools and approaches for achieving LDN when developing NAPs (UNCCD and UNU-EHS, forthcoming); and (c) the ENACT Partnership (Enhancing Nature-based Solutions for an Accelerated Climate Transformation), which aims to collaborate and build support across the Rio Conventions through a collective voice for increased evidence-based policy coherence to integrate action on climate change, biodiversity and land degradation through NbS.

Source: Authors

Figure 1: Linkages between the Rio Conventions and the Sendai Framework, specifically through ecosystem-based approaches, in support of SDG implementation. Guidance documents are provided in Table 2

In addition, several guidance materials promote the general integration of synergies and alignment on the multiple goals of the Rio Conventions and the Sendai Framework in the respective planning processes, as presented in Table 2. This includes guidance to leverage synergies between CCA and biodiversity through NAPs and NBSAPs (UNFCCC et al., 2022), or between CCA and DRR (UNDRR, 2021a). The parties to the Rio Conventions and parties implementing the Sendai Framework can access these targeted resources to strengthen synergies and integrate more coherent policy objectives into the respective tools and processes.

Table 2: Relevant guidance and strategies on leveraging synergies for national focal points to the Rio Conventions and Sendai Framework, with specific relevance to the national-level instruments

Convention/ Framework	National-level instruments	Examples of guidance and strategies on leveraging synergies
CBD	**National Biodiversity Strategies and Action Plans (NBSAPs)**	**To integrate disaster risk reduction:** • Strengthening Disaster Risk Reduction in National Biodiversity Strategies and Action Plans: Recommendations and Guidance for Governments (UNDRR, 2024) **To integrate climate change mitigation and adaptation:** • Promoting Synergies Between Climate Change Adaptation and Biodiversity (UNFCCC et al., 2022) **To integrate achieving land degradation neutrality:** • Land Degradation Neutrality for Biodiversity Conservation: How healthy land safeguards nature (UNCCD et al., 2019a)
UNCCD	**National Action Plans** **Land Degradation Neutrality (LDN) Target Setting Programme** **National Drought Plans**	**To integrate disaster risk reduction:** • Drought resilience, adaptation and management policy framework: Supporting technical guidelines (UNCCD et al., 2019b) **To integrate biodiversity conservation:** • Land Degradation Neutrality for Biodiversity Conservation: How healthy land safeguards nature (UNCCD et al., 2019a) **To integrate climate change mitigation and adaptation:** • Promoting synergies between land degradation neutrality and climate change adaptation (UNCCD and UNU-EHS, forthcoming)
UNFCCC	**Nationally Determined Contributions (NDCs)** **National Adaptation Plan (NAPs)**	**To integrate disaster risk reduction:** • Nature-based solutions for comprehensive disaster and climate risk management (UNDRR and UNU-EHS, 2023) **To integrate biodiversity conservation:** • Promoting Synergies Between Climate Change Adaptation and Biodiversity (UNFCCC et al., 2022) **To integrate achieving land degradation neutrality:** • Promoting synergies between land degradation neutrality and climate change adaptation (UNCCD and UNU-EHS, forthcoming)
Sendai Framework	**National and local disaster risk reduction strategies**	**To integrate biodiversity conservation:** • Words into Action: Nature-based Solutions for Disaster Risk Reduction (UNDRR, 2021b) **To integrate climate change mitigation and adaptation:** • Promoting synergy and alignment between Climate Change Adaptation and Disaster Risk Reduction in the context of National Adaptation Plans (UNDRR, 2021a) **To integrate achieving land degradation neutrality and address droughts:** • Drought resilience, adaptation and management policy framework: Supporting technical guidelines (UNCCD et al., 2019b)

A way forward

The shared goals and challenges of the Rio Conventions and the Sendai Framework underscore the need for strong cooperation in applying them, and for an all-of-society, whole-of-government approach to guide implementation of their strategies. Effective action requires, among other things, policy measures and collaboration that cut across national and sub-national government institutions, scientific and development sectors, affected communities, civil society organizations and private sector partnerships. Integrated planning and adequate financing of ecosystem-based approaches will play an important role in enhancing collaboration and addressing the shared goals and challenges.

Developing integrated planning approaches

Integrated spatial planning tools can provide a context for ecosystem-based approaches to be used in a multi-goal-oriented manner. Importantly, their development and implementation must be science-based, to fully address the ongoing challenge and to design measures that consider benefits and trade-offs in a targeted and efficient manner (Walz et al., 2021). The risk of missing the science basis in planning was, for example, discussed in the context of large-scale restoration programmes that promote afforestation in natural non-forested ecosystems such as grasslands with unintended consequences such as reduced water availability, changes in the composition of biodiversity, and adverse livelihood outcomes (Parr et al., 2024). Examples of integrated spatial planning tools include integrated land-use planning (ILUP) and zoning, integrated landscape management, integrated fire management and integrated coastal zone management (ICZM). As an institutional framework, ICZM can produce comprehensive policy packages that integrate ecosystem-based approaches with other structural and non-structural measures, such as disaster risk reduction or enhancement of local livelihoods. For instance, in Semarang, Indonesia, ICZM has been instrumental in valuing ecosystem services and protecting them from competing economic interests (Nehren et al., 2014). ILUP considers all relevant sectors and interests in land-use planning and seeks to balance economic, social and cultural opportunities with the need to maintain and enhance ecosystem services. Examining all land uses in an integrated manner helps to identify trade-offs and synergies, facilitating more sustainable land management (Verburg et al., 2022). There is considerable experience on integrated fire management by indigenous people and other cultural use of fire in sustainable land management, notably in the Global South (Pasiecznik and Goldammer, 2022; FAO, 2024).

To support the effective implementation of multi-goal-oriented ecosystem-based approaches, it is critical to enhance the quality and availability of geospatial data to provide baselines and monitor trends. Existing information tools, such as the LDN Toolbox created by the Land Degradation Neutrality Flagship of the Group on Earth Observations (GEO-LDN), support countries in monitoring their progress towards fulfilling their commitments under international conventions, using geospatial data. This toolbox offers various analytical tools, data sets and methods for land-use planning with the aim of achieving LDN. Other data projects, such as the Restoration Barometer from the International Union for Conservation of Nature and Natural Resources (IUCN), provide a platform for governments to simplify and streamline reporting on their restoration commitments and can help to track and record progress towards global goals, such as the "30x30" target under the Kunming-Montreal Global Biodiversity Framework, the Paris Agreement and achieving LDN.

However, geospatial data collected to track actions under the UNCCD are not only relevant in the context of land degradation. Using spatial data to assess soil organic carbon supports diagnosis of soil condition and allows timely action to prevent the loss of soil structural integrity and soil biodiversity (Stockmann et al., 2015). Furthermore, a wide range of available data can support multi-hazard risk assessments and scenario planning as part of integrated spatial planning, for example by providing information on affected people. For instance, data on agricultural drought has also been integrated into geospatial modelling approaches to measure indicators for monitoring Target B of the Sendai Framework ("number of affected people") in the absence of loss and damage data (Walz et al., 2020). Consequently, these data can be used not only to monitor LDN under the UNCCD, but also to contribute to the goals of the other two Rio Conventions and the Sendai Framework.

Scientific collaborations such as the Science Based Targets Initiative can ensure that planning activities are targeted and that they consider the potential trade-offs between multiple goals in specific assessments. In this regard, enhancing recognition and integration of different knowledge systems is also key to achieving multiple goals. Indigenous knowledge systems often take a holistic approach to land management, integrating biodiversity conservation, sustainable land use and climate adaptation. For example, rotational grazing, hunting and fishing systems or agroforestry systems allow for recovery of natural resources and landscape heterogeneity (IPBES, 2018). Engaging Indigenous and local communities in implementing the Rio Conventions can enhance participation and ownership, leading to more effective and sustainable outcomes.

Financing ecosystem-based approaches

Existing funds should be used more efficiently and effectively to implement ecosystem-based approaches more widely. For instance, more robust collaboration among national focal points for the Rio Conventions and the Sendai Framework focal points can reduce major costs of country programmes and help to close financing gaps (**Box 1**). This can be achieved through a coordinated approach to mobilizing finance, technology transfer and capacity-building. Potential entry points include building synergies between global funds, such as the Global Environment Facility, Green Climate Fund, Adaptation Fund and funds responding to loss and damage. In this

Box 1: Aligning land restoration activities across the Rio Conventions in Rwanda to increase revenues and reduce costs

Land restoration is an ecosystem-based approach that can address multiple challenges related to climate change and disaster risks, biodiversity loss and land degradation. It is implemented worldwide and is receiving increasing attention within the United Nations Decade on Ecosystem Restoration (2021–2030). However, national land restoration activities contributing to the goals of the different Conventions are widely implemented in silos, despite the immense potential for synergies. A study of the Economics of Land Degradation Initiative in cooperation with the Rwandan Ministry of Agriculture and Animal Resources has shown that transaction costs related to the planning, coordination, monitoring and evaluation of restoration activities can be reduced by 56 per cent, translating into $45.6 million, if they are jointly programmed and implemented instead of being conducted in national processes that address the goals of the three Rio Conventions separately (Mirzabaev et al., 2023). The study estimates that every dollar invested in land restoration, particularly in the form of converting cropland to agroforestry systems, results in $1.53 of revenues due to decreased soil erosion and new revenue streams; it also significantly contributes to enhancing food security.

context, it is crucial to align financing for climate impact mitigation, adaptation and DRR with humanitarian, peace and development efforts to reach those most vulnerable and at risk, including migrants, women and people with disabilities, and to ensure that no one across society is left behind.

Besides the more efficient and effective use of financial resources, there is a strong need to create incentives and to build use cases for promoting private sector innovation and investments in ecosystem-based approaches. Initiatives such as the Glasgow Financial Alliance for Net Zero, which involves over 450 financial institutions committing $130 trillion to achieving net zero emissions by 2050, present substantial opportunities. Redirecting a portion of these investments towards ecosystem-based approaches could significantly bolster climate and disaster resilience efforts. It is still important that these finance initiatives do not only consider, for example, climate mitigation, but that they are mindful of the multiple goals to take trade-offs into account and avoid unintended outcomes, as explained above.

It is a positive development that there has been a significant increase in private financing for nature, including ecosystem-based approaches, in recent years. The United Nations Environment Programme Finance Initiative reported an elevenfold surge from $9.4 billion to over $102 billion in just four years. Continued momentum could lead to $1.45 trillion being directed into financing for nature by 2030 (Smith et al., 2024). Opportunities for integrating ecosystems and ecosystem-based approaches into private sector financing include harnessing biodiversity credits, using Payments for Ecosystem Services in carbon and restoration, and influencing supply chains related to forestry, agriculture and sustainable fisheries. However, these financing opportunities must be planned and implemented equitably to reduce conflicts and trade-offs between the financing objectives and the interests of local communities (Löfqvist et al., 2023).

References

Convention on Biological Diversity (2024). Ecosystem Approach. Available at https://www.cbd.int/ecosystem

Estrella, Marisol, and Nina Saalismaa (2013). Ecosystem-based disaster risk reduction (Eco-DRR): an overview. In Fabrice Renaud, Karen Sudmeier-Rieux and Marisol Estrella, eds. ***The role of ecosystems in disaster risk reduction***. Tokyo: United Nations University Press.

Food and Agriculture Organization of the United Nations (FAO) (2024). Integrated Fire Management Voluntary Guidelines – Principles and strategic actions. Second edition. Forestry Working Paper, No. 41. Rome. https://doi.org/10.4060/cd1090en

Intergovernmental Panel on Climate Change (2019). ***Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems***. P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.-O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M, Belkacemi, J. Malley, (eds.). Cambridge: Cambridge University Press. Available at https://www.ipcc.ch/srccl/download/

_____(2022). ***Climate Change 2022: Impacts, Adaptation and Vulnerability***. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.). Cambridge: Cambridge University Press. Available at https://www.ipcc.ch/report/ar6/wg2/

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2018). ***The IPBES assessment report on land degradation and restoration***. L. Montanarella, R. Scholes and A. Brainich (eds.). Bonn: IPBES Secretariat. Available at https://doi.org/10.5281/zenodo.3237392

_____ (2019). ***Summary for policymakers of the global assessment report on biodiversity and ecosystem services***. S. Díaz, J. Settele, E. S. Brondízio E.S., H. T. Ngo, M. Guèze, J. Agard, A. Arneth, P. Balvanera, K. A. Brauman, S. H. M. Butchart, K. M. A. Chan, L. A. Garibaldi, K. Ichii, J. Liu, S. M. Subramanian, G. F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, A. Pfaff, S. Polasky, A. Purvis, J. Razzaque, B. Reyers, R. Roy Chowdhury, Y. J. Shin, I. J. Visseren-Hamakers, K. J. Willis, and C. N. Zayas (eds.). Bonn: IPBES Secretariat. Available at https://doi.org/10.5281/zenodo.3553579

Löfqvist, Sara, and others (2023). How Social Considerations Improve the Equity and Effectiveness of Ecosystem Restoration. ***Bioscience***, vol. 73, Issue 2, 134–148. https://doi.org/10.1093/biosci/biac099

Mirzabaev, Alisher, and others (2023). ***Economics of Harmonizing Land Restoration Activities across the Rio Conventions in Rwanda and Implications for Food Security***. A Study for the Economics of Land Degradation Initiative. Bonn: ELD. Available at https://www.eld-initiative.org/fileadmin/ELD_Filter_Tool/Case_Study_Rwanda_2023/Rwanda_2023_Rio_Synergies_ELD_Case_Study_Report.pdf

Nehren, Udo, and others (2014). ***The Ecosystem-Based Disaster Risk Reduction Case Study and Exercise Source Book***. Geneva and Cologne: Partnership for Environment and Disaster Risk Reduction and Center for Natural Resources and Development. Available at https://www.unep.org/resources/case-study/ecosystem-based-disaster-risk-reduction-case-study-and-exercise-source-book

Olsson, Lennart, and others (2019). Land Degradation. In: ***Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems***. P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.-O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M, Belkacemi, J. Malley, (eds.). Cambridge: Cambridge University Press. Available at https://www.ipcc.ch/site/assets/uploads/sites/4/2022/11/SRCCL_Chapter_4.pdf

Pasiecznik, Nick and Johann Georg Goldammer (eds.) (2022). Towards fire-smart landscapes. ***Tropical Forest***, Issue 61. Tropenbos International, Ede, the Netherlands. xiv +191 pp. https://doi.org/10.55515/DVRK2501

Parr, Catherine, Mariska te Beest and Nicola Stevens (2024). Conflation of reforestation with restoration is widespread. In ***Science***, vol. 383, 698–701. https://doi.org/10.1126/science.adj0899

Passarelli, David, Fatima Denton and Adam Day (2021). ***Beyond Opportunism: The UN Development System's Response to the Triple Planetary Crisis***. New York: United Nations University. Available at https://i.unu.edu/media/cpr.unu.edu/attachment/4977/UNUTriplePlanetaryCrisis2021.pdf

Pereira, João Santos, and others (2007). Net ecosystem carbon exchange in three contrasting Mediterranean ecosystems – the effect of drought. ***Biogeosciences***, vol. 4, Issue 5, 791–802. Available at https://doi.org/10.5194/bg-4-791-2007

Pörtner, Hans-Otto, and others (2021). ***Scientific Outcome of the IPBES–IPCC co-sponsored workshop on biodiversity and climate change***. Bonn: IPBES Secretariat. https://doi.org/10.5281/zenodo.4659158

Reichhuber, Anke, and others (2019). ***The Land-Drought Nexus: Enhancing the role of land-based interventions in drought mitigation and risk management***. A Report of the Science-Policy Interface. Bonn: UNCCD. Available at https://catalogue.unccd.int/1211_03EP_UNCCD_SPI_2019_Report_2.pdf

Smith, Jessica, and others (2024). ***New Green Shoots: Emerging Trends in Nature and Sustainable Finance***. Poster AS-WBF-2024-00454 presented to the third World Biodiversity Forum, Davos, Switzerland. Available at https://www.unepfi.org/wordpress/wp-content/uploads/2024/06/Nature-Finance-Supplementary-information-1.pdf

Stockmann, Uta, and others (2015). Global soil organic carbon assessment. ***Global Food Security***, vol. 6 (October), 9–16. https://doi.org/10.1016/j.gfs.2015.07.001

United Nations Convention to Combat Desertification, and others (2019a). ***Land Degradation Neutrality for Biodiversity Conservation: How healthy land safeguards nature***. Bonn. Available at https://catalogue.unccd.int/1340_LDN_BiodiversityGM_Report.pdf

United Nations Convention to Combat Desertification, and others (2019b). ***Drought Resilience, Adaptation and Management Policy Framework: Supporting Technical Guidelines***. Bonn. Available at https://catalogue.unccd.int/1246_UNCCD_drought_resilience_technical_guideline_EN.pdf

United Nations Convention to Combat Desertification and United Nations University Institute for Environment and Human Security (forthcoming). ***Promoting synergies between land degradation neutrality and climate change adaptation***. Available at https://www.unccd.int/resources/publications/promoting-synergies-between-land-degradation-neutrality-and-climate-change

United Nations Framework Convention on Climate Change (n.d.). ***Expert insights and learning: Why do biodiversity and adaptation actions matter?*** Available at https://www4.unfccc.int/sites/NWPStaging/News/Pages/Expert-insights-and-learning.-Why-do-biodiversity-and-adaptation-actions-matter.aspx

_____ (2018). ***Online Guide on Loss and Damage***. Available at: https://unfccc.int/sites/default/files/resource/Online_guide_on_loss_and_damage-May_2018.pdf

United Nations Framework Convention on Climate Change, and others (2022). ***Promoting synergies between climate change adaptation and biodiversity through the National Adaptation Plan (NAP) and National Biodiversity Strategies and Action Plan (NBSAP) processes.*** Bonn: United Nations Climate Change Secretariat. Available at https://unfccc.int/sites/default/files/resource/UNFCCC-NWP_synergies_NAP-NBSAP_technical-brief.pdf

United Nations Office for Disaster Risk Reduction (2020). ***Ecosystem-Based Disaster Risk Reduction: Implementing Nature-based Solutions for Resilience***. Bangkok: United Nations Office for Disaster Risk Reduction – Regional Office for Asia and the Pacific. Available at https://www.undrr.org/media/48333

_____ (2021a). ***Promoting Synergy and Alignment Between Climate Change Adaptation and Disaster Risk Reduction in the Context of National Adaptation Plans: A Supplement to the UNFCCC NAP Technical Guidelines***. Geneva. Available at https://www4.unfccc.int/sites/NAPC/Documents/Supplements/2021_Promoting%20Synergy%20-%20Supplement%20to%20the%20NAP%20Technical%20Guidelines.pdf

_____ (2021b). ***Words into Action: Nature-based Solutions for Disaster Risk Reduction***. Geneva. Available at https://www.undrr.org/words-action-nature-based-solutions-disaster-risk-reduction

_____ (2024). ***Strengthening Disaster Risk Reduction in National Biodiversity Strategies and Action Plans: Recommendations and Guidance for Governments.*** Geneva. Available at https://www.undrr.org/media/100501

United Nations Office for Disaster Risk Reduction and United Nations University Institute for Environment and Human Security (2023). ***Nature-based Solutions for Comprehensive Disaster and Climate Risk Management***. Geneva. Available at https://www.undrr.org/media/97918

United Nations Sustainable Development (1992). Agenda 21. United Nations Conference on Environment & Development Rio de Janeiro, Brazil, 3 to 14 June 1992. Available at https://sdgs.un.org/sites/default/files/publications/Agenda21.pdf

Verburg, Peter H., and others (2022). ***The Contribution of Integrated Land Use Planning and Integrated Landscape Management to Implementing Land Degradation Neutrality: Entry Points and Support Tools***. Bonn: UNCCD. Available at https://www.unccd.int/sites/default/files/2023-09/UNCCD%20Integrated%20Land%20Use%20Planning-rev.pdf

Walz, Yvonne, and others (2020). Monitoring progress of the Sendai Framework using a geospatial model: The example of people affected by agricultural droughts in Eastern Cape, South Africa. ***Progress in Disaster Science***, vol. 5 (January), 100062. Available at https://www.sciencedirect.com/science/article/pii/S2590061719300626

Walz, Yvonne, and others (2021). ***Coherence and Alignment among Sustainable Land Management, Ecosystem-based Adaptation, Ecosystem-based Disaster Risk Reduction and Nature-based Solutions***. Bonn: United Nations University Institute for Environment and Human Security. Available at https://collections.unu.edu/eserv/UNU:8495/Walz_et_al._Online_NBS_211215_META.pdf

Walz, Yvonne, and others (2023). ***Nature-based Solutions for integrated planning and implementation of disaster and climate risk management***. Policy brief. Bonn: United Nations University Institute for Environment and Human Security. Available at http://collections.unu.edu/eserv/UNU:9218/A20230913_NbS_UNU-EHS_Policy-Brief.pdf

Yuan, Wenping, and others (2016). Severe summer heatwave and drought strongly reduced carbon uptake in Southern China. ***Scientific Reports***, vol. 6 (January). Available at https://doi.org/10.1038/srep18813