Thematic Paper 2

Linkages Between Biodiversity and Climate Change and the Role of Science-Policy-Practice Interfaces for Ensuring Coherent Policies and Actions

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UFZ HELMHOLTZ
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Nuclear Safety and Consumer Protection

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Linkages Between Biodiversity and Climate Change and the Role of Science–Policy–Practice Interfaces for Ensuring Coherent Policies and Actions

Author: Johannes Förster (Helmholtz Centre for Environmental Research – UFZ)
Reviewers: Zita Sebesvari (United Nations University Institute for Environment and Human Security), Terese Thoni (Lund University Centre for Environmental and Climate Science (CEC) and Helmholtz Centre for Environmental Research – UFZ), and one anonymous reviewer

Key Messages

- Climate change and biodiversity loss are global security issues: their negative impacts undermine many Sustainable Development Goals (SDGs), challenging the stability of states and societies.

- The climate and biodiversity crises are increasingly seen not only as mutually reinforcing but as one crisis with two acute emergencies. Delaying action is by far costlier to society than taking immediate action.

- Transformative changes are required to decarbonise the economy and reverse the destruction and degradation of ecosystems.

- Climate, biodiversity, and society are interlinked, requiring synergies and coherence in policies and actions, in particular, related to nationally determined contributions (NDCs), National Adaptation Plans (NAPs), and National Biodiversity Strategies and Action Plans (NBSAPs).

- Nature-based solutions (NbS) include biodiversity conservation and restoration measures that support climate change mitigation, adaptation, and sustainable development. However, climate change also affects ecosystems and reduces their potential to serve as NbS.

- Science can provide knowledge, tools, and methods for assessing the interlinkages of climate, biodiversity, and sustainable development and contribute to participatory decision-making processes for navigating synergies, trade-offs, and uncertainties.
- Science–policy processes that bring together actors with different knowledge on climate, biodiversity, and sustainable development can support the co-creation and implementation of more coherent policies and actions from the local to the global scale.

Introduction

This Thematic Paper summarises key findings on interlinkages between biodiversity and climate change and illustrates how collaboration between science, policy, and practice at different levels can help to increase policy effectiveness and coherence. It supports the development of more coherent climate and biodiversity policies.

Climate change and biodiversity loss are issues of global security, as their negative impacts on socio–ecological systems undermine many of the SDGs (Intergovernmental Panel on Climate Change [IPCC], 2018, Security Council Report, 2021). Accelerating climate change and biodiversity loss undermines sustainable development (IPCC, 2018, Intergovernmental Science–Policy Platform on Biodiversity and Ecosystem Services [IPBES], 2019), which challenges the stability of states and societies (Detges et al., 2020). For achieving sustainable development—in particular by eradicating poverty and hunger, providing safe water, reducing inequality, and maintaining healthy ecosystems—it is critical to consider the interlinkages between climate, biodiversity, and society (Pörtner et al. 2021).

The use of fossil fuels is the main reason for climate change. Land and sea use change—such as the expansion of agriculture, deforestation, and overfishing, as well as pollution—are key drivers for biodiversity loss and contribute to climate change (IPCC, 2018, IPBES, 2019). Increasingly, climate change itself is becoming a major driver for ecosystem change and biodiversity loss (IPBES, 2019). There is the risk that feedback loops between climate change and biodiversity loss increase the likelihood of crossing tipping points in the Earth's system (Pörtner et al., 2021). Delaying action on climate change and biodiversity loss is far more costly to society than taking immediate action (Stern, 2007; Dasgupta, 2021). The success of addressing climate change, biodiversity loss, and sustainable development ultimately depends on the reduction of emissions from fossil fuels by decarbonising the economy and reversing the destruction and degradation of ecosystems (Pörtner et al. 2021).

Given these scientific findings, actors across civil society, including youth movements, recognise the urgent need for action. Business leaders increasingly identify the failure to address climate change and biodiversity loss as one of the most important global risks, on par with the risk posed by weapons of mass destruction (World Economic Forum [WEF], 2021). While governments are putting forward pledges for reaching net-zero carbon emissions and halting biodiversity loss, the actions taken are insufficient for addressing the challenges. The IPBES (2019) Global Assessment diagnoses: “Goals for conserving and sustainably using nature and achieving sustainability cannot be met by current trajectories, and goals for 2030 and beyond may only be achieved through transformative changes across economic, social, political and technological factors” (p. 14).

This transformation requires processes of co-creation that unite actors from science, policy, the private sector, and civil society to develop knowledge and implement approaches that can generate equitable and effective outcomes for climate, biodiversity, and society (e. g., Abson et al., 2017). The knowledge and processes needed can be generated through well-designed science–policy–practice interfaces, described by van den Hove (2007) as “social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making.” Such science–policy–practice interfaces can help to create coherence across climate and biodiversity policies and actions and build synergies with other SDGs.

Key Findings and Recommendations for the Interlinkages Between Biodiversity and Climate Change

These key findings are primarily based on IPBES, 2019 and IPCC, 2018.

Climate change and biodiversity loss are issues of global security.
"Climate change and biodiversity loss pose significant threats for human livelihoods, food security and public health, and such negative impacts are disproportionately felt by communities that are socially, politically, geographically and / or economically marginalized." (Pörtner et al. 2021).

Climate change has negative impacts on ecosystems, human health, and agriculture. Increasing global warming means there is a high risk of not achieving many SDGs, such as eradicating poverty and hunger, providing safe water, reducing inequality, and protecting ecosystems (IPCC, 2018). Although climate change itself might not be a direct cause of conflict, its impacts on ecosystems and natural resources such as land and water can undermine food, water, and energy security; exacerbate the drivers of conflict; and lead to migration (Detges et al., 2020, Security Council Report, 2021).

Private business organisations are also increasingly recognising the risks of climate change and biodiversity loss. The WEF's (2021) *The Global Risks Report 2021* found that international business leaders perceive biodiversity loss and the failure to address climate change to be issues of great concern: "In the 5–10 year horizon, environmental risks such as biodiversity loss, natural resource crises and climate action failure dominate; alongside weapons of mass destruction, adverse effects of technology and collapse of states or multilateral institutions" (p. 7). In the WEF's (2022) The Global Risks Report 2022 the failure to take action on climate change, extreme weather events, and biodiversity loss are identified to be the top three global risks over the next ten years.

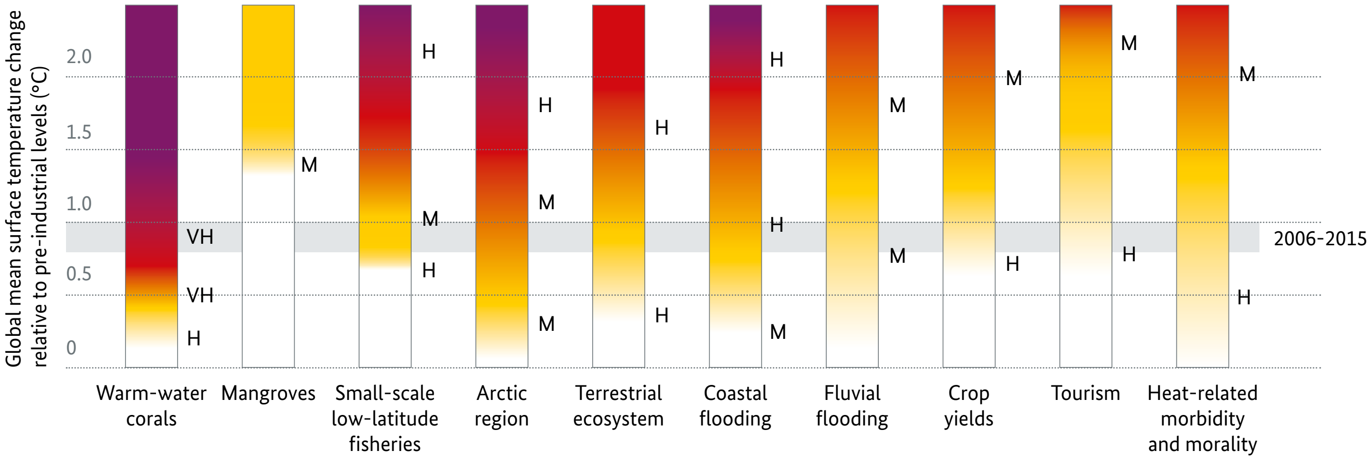
Climate change impacts on natural and human systems are widespread and undermine mitigation, adaptation, and sustainable development.
Climate change impacts on ecosystems and socio–ecological systems, in particular, increase with global warming exceeding 1.5°C (IPCC, 2018). There is a high to very high risk that impacts can become severe, widespread, and irreversible, which also undermines options for ecosystem-based mitigation and adaptation (Figure 1). Changes in the frequency and intensity of extreme events are having adverse impacts on species and ecosystems (e. g., reducing species range), causing ecosystem loss and degradation (e. g., of coral reefs, forests, and coastal ecosystems), which exacerbates risks to livelihoods, human health, infrastructure, and food systems (IPCC, 2018; IPBES, 2019).

These impacts on biodiversity have consequences for the provision of ecosystem services such as water and carbon sequestration. The intensity of storms, wildfires, pest outbreaks, and land degradation are projected to increase. This makes carbon stocks in forests, wetlands, and other ecosystems vulnerable and can turn ecosystems from carbon sinks to carbon sources (IPCC, 2018).

Particularly in tropical regions, biodiversity faces negative impacts from the combination of climate change, intensified land use, as well as through the direct exploitation of aquatic and terrestrial species. In boreal, subpolar, and polar regions, marine and terrestrial ecosystems' biodiversity is heavily impacted by warming, sea ice retreat, and increasing ocean acidification (IPBES, 2019).

Limiting global warming to 1.5°C would lower the land area at risk of undergoing ecosystem transformations by 50 % when compared to 2°C warming (IPCC, 2018). If global warming exceeds 2°C, there is an increasing risk that elements of the Earth's system could cross thresholds (irreversible tipping points), causing fundamental changes in the characteristics of large regions. For example, global warming of up to 3°C is very likely to cause the Arctic to become ice-free in summer, turn parts of the rainforests in Central America into savannah systems (medium confidence), and cause drastic reductions, e. g., in global maize crop production (high confidence) (IPCC, 2018).

Figure 1. Impacts and risks for selected natural, managed, and human systems as assessed by and presented in IPCC (2018).



Note: Risks / impact categories include undetectable (white), moderate (yellow), high (red), and very high (purple) with confidence levels of L = low, M = medium, H = high, and VH = very high.

Biodiversity loss increases human vulnerability to climate change.

Among the multiple drivers that cause biodiversity loss, land and sea use change, direct exploitation, climate change, pollution, and invasive alien species are the most common (IPBES 2019). The interaction of these drivers can increase the negative impacts on biodiversity. For example, agricultural production relies on few crop varieties, which enhances risks related to climate change: “Reductions in the diversity of cultivated crops, crop wild relatives and domesticated breeds mean that agroecosystems are less resilient against future climate change, pests and pathogens” (IPBES, 2019, p. 12). There are also large regional differences in the projected impacts of climate change on biodiversity, ecosystems, and nature’s contribution to people[1] (IPBES, 2019). These impacts on biodiversity and ecosystems have consequences on ecosystem services that people rely on; therefore, ecosystem degradation can increase poverty and food insecurity, which disproportionally impacts poor communities and indigenous peoples (Convention on Biological Diversity, 2019).

Strategies for addressing these multiple drivers together can enhance the resilience of natural and human systems. Biodiversity conservation and sustainable management of ecosystems—for example, by enhancing crop diversity in agricultural systems while reducing pollution—can help to build resilience to climate change with multiple benefits for reaching other SDGs (IPCC, 2018; IPBES, 2019). Therefore, strategies and approaches that take a systems perspective are required to ensure that the measures for addressing the drivers of climate change and biodiversity loss act in synergy and do not undermine development objectives.

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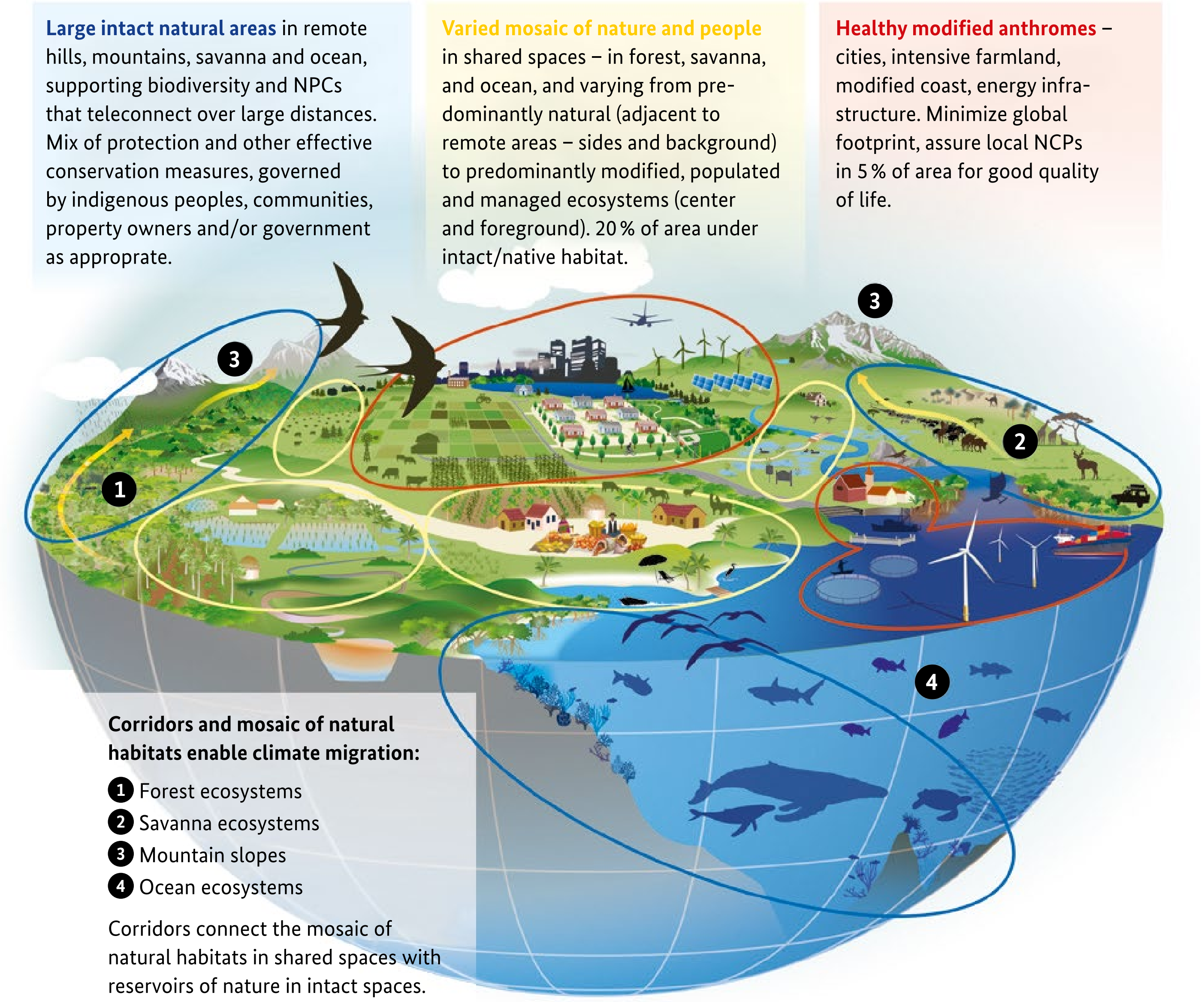
[1] Definition according to the IPBES (n.d.) Glossary: “Nature’s contributions to people (NCP) are all the contributions, both positive and negative, of living nature (i.e. diversity of organisms, ecosystems, and their associated ecological and evolutionary processes) to the quality of life for people. Beneficial contributions from nature include such things as food provision, water purification, flood control, and artistic inspiration, whereas detrimental contributions include disease transmission and predation that damages people or their assets. Many NCP may be perceived as benefits or detriments depending on the cultural, temporal or spatial context.”

Figure 2. Illustration of a multifunctional land- and seascape with ecosystems providing critical contributions from nature to people.



Large intact natural areas in remote hills, mountains, savanna and ocean, supporting biodiversity and NPCs that teleconnect over large distances. Mix of protection and other effective conservation measures, governed by indigenous peoples, communities, property owners and/or government as appropate.

Varied mosaic of nature and people in shared spaces – in forest, savanna, and ocean, and varying from predominantly natural (adjacent to remote areas – sides and background) to predominantly modified, populated and managed ecosystems (center and foreground). 20 % of area under intact/native habitat.

Healthy modified anthromes – cities, intensive farmland, modified coast, energy infrastructure. Minimize global footprint, assure local NCPs in 5 % of area for good quality of life.

Corridors and mosaic of natural habitats enable climate migration:

1. Forest ecosystems
2. Savanna ecosystems
3. Mountain slopes
4. Ocean ecosystems

Corridors connect the mosaic of natural habitats in shared spaces with reservoirs of nature in intact spaces.

Figure 2 shows a multifunctional ’scape across land, freshwater and marine biomes, including large, intact wilderness spaces (blue circles), shared spaces (yellow circles) and anthromes (red circles). In shared spaces the mosaic of intact natural habitat provides critical contributions from nature to people. Corridors of natural habitat (yellow arrows) are illustrated facilitating climate migration of species up elevational gradients. This multifunctional ‘scape concept can assist integrating global and large-scale targets within local geographies.” Source: Pörtner et al. 2021, p. 46.

Nature-based solutions can contribute to mitigation and adaptation, but climate change is also reducing the potential of ecosystems to serve as NbS.

NbS, such as wetland conservation, reducing deforestation, and ecosystem restoration, can have significant benefits for climate change mitigation, adaptation, and conserving biodiversity while creating co-benefits for multiple other SDGs (see Figure 2, as well as European Environment Agency, 2021; IPBES, 2019; Reise et al., 2022). Ecosystem-based approaches to adaptation and disaster risk reduction can also reduce the negative impacts of climate change (Secretariat of the Convention on Biological Diversity, 2019). Scientific studies provide different estimates on the mitigation potential of ecosystems. Some state that, if well designed, NbS could contribute about one third of the mitigation needed until 2030, while providing benefits for water filtration, flood regulation, soil health, biodiversity habitat, and enhanced climate resilience (Griscom et al., 2017). Others mention that it is likely that the available scientific literature overestimates the realistic potential of NbS for climate change mitigation, but at the same time stress that NbS are an important component of global mitigation efforts to reaching the goals of the Paris Agreement and bring multiple benefits for people and the environment and should be promoted actively (Reise, et al, 2022). They all share the view that NbS provide multiple benefits for climate change mitigation, adaptation, biodiversity, and people.

Pörtner et al. (2021) suggest that "avoiding and reversing the loss and degradation of carbon- and species-rich ecosystems on land and in the ocean is of highest importance for combined biodiversity protection and climate change mitigation actions with large adaptation co-benefits." However, not all approaches involving natural elements are beneficial for biodiversity. For example, large-scale tree plantations with non-native species can have negative impacts on biodiversity. It is therefore important to ensure that the design of such NbS benefits biodiversity—also because failing to do so can reduce their effectiveness for climate change mitigation and adaptation (for further information, see Thematic Paper 3: Nature–Based Solutions: An Approach for Joint Implementation of Climate and Biodiversity Commitments).

A further challenge is the extent of required action: current options for achieving net-zero emissions include the use of biomass as renewable energy or bioenergy with carbon capture and storage (also known as BECCS). However, the scale of biomass production that would be required is expected to have significant negative impacts on biodiversity and society, including competition for land with the potential of undermining food security and leading to further increase of land grabbing (Aha & Ayitey, 2017; Deprez et al., 2019).

Furthermore, ecosystems are vulnerable to climate change, and increasing global warming causes fundamental and irreversible ecosystem changes (Figure 1). This can turn ecosystems from being carbon sinks into carbon sources and undermine their ability to provide ecosystem services critical for adaptation and sustainable development. For example, climate-related hazards also negatively impact ecosystems and their important role in disaster risk reduction (Walz et al., 2021). A better understanding of such feedback loops and accounting for the consequences climate change has on biodiversity and the provision of ecosystem services are both critical for decision-making (IPBES, 2019).

The Need for Science–Policy–Practice Processes That Enhance Policy Coherence

There is considerable potential for improving the coherence of climate and biodiversity policies. Better aligning climate and biodiversity policies can also support the wise use of scarce resources and support the more effective implementation of actions with benefits for multiple societal goals. Harnessing such synergies requires processes that enable the collaboration of actors from science, policy, and practice for using the best available knowledge. Such science–policy–practice processes can include local initiatives and networks but also more formal platforms at national and international scales (see examples below and also the guidance on science–policy interfaces by the Committee of Experts on Public Administration, 2021). Aligning climate and biodiversity strategies also requires strong institutional coordination between national ministries (horizontal) and between national and subnational stakeholders (vertical) (Organisation for Economic Co-operation and Development, 2020).

Building coherence in national climate and biodiversity strategies: Given the multiple benefits NbS can provide for mitigation, adaptation, biodiversity conservation, and sustainable development, there is great potential for synergies between the respective policies (Chausson et al., 2020). For example, strategically targeting areas with high biodiversity and high carbon value for the protection of 30 % of the global land surface “could safeguard more than 500 gigatons of carbon” (De Lamo et al., 2020). Hence, climate change strategies increasingly include NbS: of 168 Parties to the Paris Agreement, 96 report in their NDC that they use NbS for mitigation, 91 use NbS also for adaptation, and 82 use NbS for both mitigation and adaptation (Bakhtary et al., 2021). However, Seddon et al. (2020) found that NbS actions are often described as being in the planning stage, few targets and actions are specified, and monitoring of implementation is often not mentioned. Ecosystems other than forests—such as wetlands and coastal and marine ecosystems—are not well represented (Seddon et al., 2020). Hence, there is considerable room for including NbS more strategically into national strategies, in particular, for harnessing synergies between NDCs and NAPs. The United Nations Development Programme (2019) and Martin et al. (2020) developed guidance on integrating NbS in NDCs for supporting both mitigation and adaptation.

Learning from REDD+: Experiences from the development and assessment of REDD+[2] strategies indicate the scale of multidisciplinary science-policy processes needed for implementing a global climate policy and monitoring and verifying its effectiveness over time. While REDD+ has great potential to mitigate greenhouse gas emissions, support biodiversity conservation, and create multiple benefits for the SDGs, such cross-sectoral synergies do not come by default; they have to be proactively pursued and built (Lima et al., 2017). Hence, the development and implementation of REDD+ strategies require targeted science-policy processes from local to global scales involving a large range of stakeholders, including indigenous peoples and local communities, natural and social scientists, practitioners from various sectors, and policy-makers at national and international levels. Such participatory processes should seek to ensure that climate and biodiversity policies and strategies are equitable and effective. For example, it has been shown that granting full property rights to indigenous communities is effective in reducing deforestation over the long term (Baragwanath & Bayi, 2020), a critical fact to consider in the design of REDD+ policies.

How science can support implementation: The implementation of policies and mechanisms such as REDD+ needs to be accompanied by natural and social science assessments on the effectiveness of REDD+ activities, their compliance with safeguards for biodiversity and people, and the verification of emission reductions and permanence. For example, CIFOR's Global Comparative Study on REDD+ provides critical insights into the design and implementation of REDD+ involving a participatory and iterative research approach from the local to the global scale. Ideally, research aiming at supporting decision-making is co-developed through engagement of and trust building with partners from the relevant policy levels and sectors. This allows understanding information needs and jointly defining the research questions leading to more robust, credible and legitimate research outputs. Thereby, the co-produced knowledge and tools are better tailored to support decision-making on policies and practice that can facilitate transformational change.

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[2] Reducing Emissions from Deforestation and Forest Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (REDD+)

Similar participatory science–policy–practices processes are required to assess options for achieving carbon neutrality (net-zero targets) by 2050 (IPCC, 2018). For example, the pathways considered under the IPCC for achieving emission reductions and net-zero by 2050 involve large-scale afforestation as biomass supply for bioenergy with carbon capture and storage (BECCS) (IPCC, 2018). If poorly designed and managed, such ecosystem-based mitigation strategies can have considerable negative impacts on biodiversity and undermine multiple SDGs, in particular food security (Deprez et al., 2019), as also highlighted by the joint IPBES-IPCC report:

> “Planting bioenergy crops (including trees, perennial grasses or annual crops) in monocultures over a very large share of total land area is detrimental to ecosystems, reduces supply of many other nature’s contributions to people and impedes achievement of numerous Sustainable Development Goals.” (Pörtner et al., 2021, p. 18)

Furthermore, such activities are also vulnerable to climate change. For example, forest plantations intended for biomass production, enhancing carbon sinks, and supporting adaptation can fail if implemented as monocultures (Pawson et al., 2013). The combination of climate change impacts (e. g., droughts) and a lack of diversity in tree species can make it easier for pests to spread and cause the dieback of trees. Enhancing biodiversity in managed landscapes can significantly increase climate resilience, as demonstrated, for example, in forests and agricultural systems (Altieri et al., 2015; Pawson et al., 2013). Such diversification of forests, crops, or landscapes can also act as insurance for local communities. There are similar examples for other sectors, including urban planning (European Environment Agency, 2021).

Another example of a science-policy process is the integration of climate and biodiversity into accounting systems and decision-making at national and corporate levels. Recently, the Standard for Ecosystem Accounting has been adopted under the United Nations System of Environmental Economic Accounting (2021). It provides guidance on how to assess and integrate ecosystems and ecosystem services into national accounts to ensure better representation of biodiversity in decision-making. Similar voluntary efforts take place within the business community for better consideration and coherent accounting of carbon and biodiversity within and across business sectors (e. g., the work of the Natural Capital Coalition). Collaboration and exchange between science, policy, and practice help to ensure that the developed biodiversity accounting is robust, scientifically sound, and applicable.

Science-policy interfaces working on biodiversity and climate change for supporting decision-making.

Science-policy processes such as the IPCC and the IPBES are prominent examples of science-policy interfaces providing cutting-edge climate and biodiversity knowledge to inform international decision-making. The work of the IPCC and the IPBES provides critical evidence on the interlinkages of climate and biodiversity and its implications for policy-making. Both have been mandated by their member states to synthesise knowledge, assess knowledge gaps, and provide an overview of policy options (e. g., the IPCC [2018] Special Report on Global Warming of 1.5°C and the IPBES [2019] Global Assessment). However, the implementation of climate and biodiversity strategies has to happen at national and local scales where diverging stakeholder interests and needs have to be managed. Strategies need to be tailored to the specific context. This is particularly relevant for ensuring coherence and synergies between NDCs, NAPs, and NBSAPs.

Therefore, interfaces that include science, policy, and practice are needed at all levels to inform coherent design and implementation of climate and biodiversity policies that is equitable, effective, and can deliver multiple benefits for sustainable development (e. g., Pettorelli et al., 2021). Many countries have implemented National Biodiversity Platforms or similar science–policy–practice interfaces to address this need; a guidance document on developing National Biodiversity Platforms is currently under review (Khan et al., in review). In addition, and at the local level, citizen science can engage the public in a process of co-creation. For example, involving citizens in assessing the potential of green space for reducing urban flood risk can create awareness, acceptance, and local ownership of NbS (Koehorst, 2020). A participatory design and decision-making process on NbS can contribute to enhancing the provision of multiple benefits to local stakeholders (Raymond et al., 2017). Ensuring the provision of multiple benefits can also make NbS more attractive and cost-effective solutions than grey infrastructure.

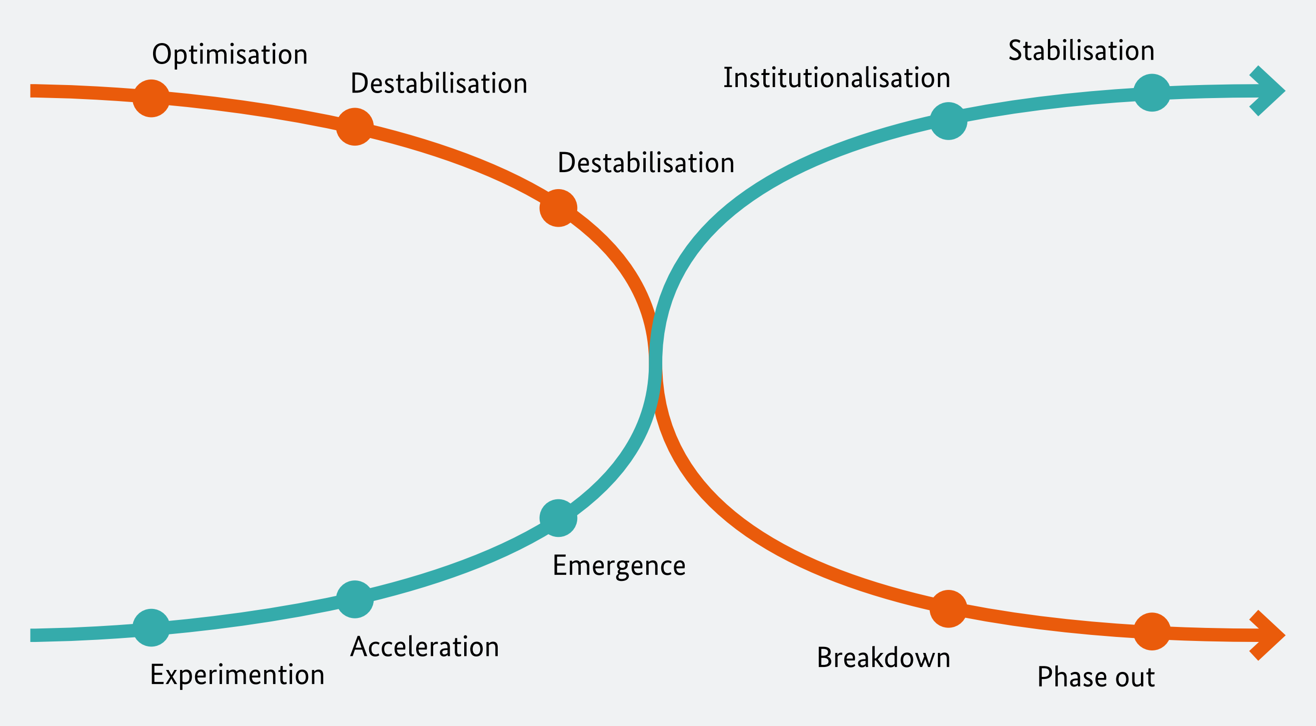
Addressing the root causes of climate change and biodiversity loss requires transformative change. Climate change and biodiversity loss are risks to sustainable development and global security that require coherent policy approaches addressing root causes and ensuring synergies across policies and actions. Indeed, Pörtner et al. (2021) conclude that “achieving the scale and scope of transformative change needed to meet the goals of the UNFCCC and CBD and the Sustainable Development Goals relies on rapid and far-reaching actions of a type never before attempted” (p. 23).

Decision-makers in communities, public agencies, and private organisations across multiple sectors of society face the challenge of developing and implementing approaches for addressing the drivers of climate change and biodiversity loss. Mainstreaming is the key: Biodiversity, climate change and sustainable development must be tackled together by the institutions that drive policy, rules, plans, investment, and action. This approach requires systemic and transformative changes that cannot be achieved by individual action. As Figure 3 illustrates, this requires enhancing (phasing in) strategies and actions for positive change and for reducing (phasing out) activities with negative impacts. Policies are required to incentivise change toward more sustainable production and consumption patterns (strategies for phasing in). At the same time, policies, as well as private and corporate activities with harmful effects on climate and biodiversity, need to be significantly reduced and ultimately replaced (strategies for phasing out) (Figure 3). In order to avoid delays in action and inequitable outcomes, it is important to address the root causes of carbon emissions and biodiversity loss in each sector (e. g., Carton et al., 2021). This requires a systemic change as summarised by the IPBES Global Assessment (2019):

> *"A key component of sustainable pathways is the evolution of global financial and economic systems to build a global sustainable economy, steering away from the current, limited paradigm of economic growth. That implies incorporating the reduction of inequalities into development pathways, reducing overconsumption and waste and addressing environmental impacts, such as externalities of economic activities, from the local to the global scales." (pp. 20–21)*

Figure 3 is a conceptual representation for societal transitions by Loorbach and Oxenaar (2018). Policies supporting transformative change should seek to enhance processes that lead to a build-up and institutionalisation of more sustainable ideas, technologies, and practices (the phasing-in of sustainable activities is shown by the arrow from the lower left to the upper right). Equally important, policies can contribute to destabilising and phasing out unsustainable systems over time (as shown by the arrow from the upper left to the lower right).

Figure 3. Conceptual representation for societal transitions.



Source: Loorbach and Oxenaar 2018. *Design adapted*

Science-policy-practice processes can support transformative change.
Designing and implementing adequate response measures requires interdisciplinary knowledge on climate, biodiversity, and society to address their interlinkages across spatial (e. g., landscape level) and temporal scales (e. g., future climate change impacts). At the same time, knowledge is needed on how to transform global systems of production and consumption, the root causes of both climate change and biodiversity loss. This transformation has implications for actors across society, including both value and behavioural changes. Therefore, transdisciplinary and participatory processes of co-designing, testing, and implementing together with public and private sectors as well as civil society and indigenous people and local communities should help to validate and adapt response measures to different circumstances and needs (e. g., Abson et al., 2017). Policies can support actors along both a phasing-in process of experimentation, emergence, and institutionalisation and the phasing-out of incumbent unsustainable practices (Figure 3).

Participation and agency across stakeholders are critical for ensuring solutions are feasible and acceptable. Interdisciplinary and transdisciplinary approaches involving science as well as knowledge holders from policy and practice (including indigenous people and local communities) can help to ensure that actions and strategies do no harm. This applies, in particular, to addressing the root causes of climate change and biodiversity loss as highlighted by the joint IPBES-IPCC report:

> *“Critical leverage points include exploring alternative visions of good quality of life, rethinking consumption and waste, shifting values related to the human-nature relationship, reducing inequalities, and promoting education and learning. The global societal disturbances caused by the COVID-19 pandemic crisis have highlighted the importance of a more resilient, sustainable and transformative path forward, leaving no one behind.” (*Pörtner et al., 2021*, p. 23)*

However, while a system approach is important for transformative change, there are also immediate opportunities for action:

In the short term (before 2030), all decision-makers could contribute to sustainability transformations, including through enhanced and improved implementation and enforcement of effective existing policy instruments and regulations, and the reform and removal of harmful existing policies and subsidies (well established). (IPBES, 2019)

Conclusion

The urgent need to address climate change and biodiversity loss requires coherent policy approaches that support transformative instead of incremental changes. Nature-based solutions (NbS), if carefully planned and implemented, can provide substantial benefits for climate change mitigation and adaptation and for biodiversity conservation at the same time. These synergies need to be addressed more strategically, in particular, in the development and implementation of NDCs and NBSAPs. Science-policy-practice interfaces can ensure strategies are adapted to local contexts and stakeholder needs and reduce trade-offs with other SDGs. To address climate change and biodiversity loss, policies are needed to enhance change at the systems level, especially to shift global production and consumption patterns toward sustainability. Addressing the root causes of the alarming current state of climate and biodiversity is paramount for achieving the SDGs—a challenging but worthwhile task for the next decade that will benefit greatly from dedicated science-policy-practice interfaces.

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Address
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53113 Bonn, Germany
T +49 228 4460-1791
E rhena.hoffmann@giz.de
I www.giz.de

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