Federal Agency for Nature Conservation

Strengthening the science-policy interface for climate and biodiversity

Recommendations from a workshop specifically for young scientists from China and Germany

POLICY BRIEF #03/2024

Summary

The interdependencies between climate and biodiversity are scientifically not yet fully understood. However, policies and actions are urgently needed to safeguard these important, interrelated fundamentals for life on earth. In this context it is crucial to foster the science-policy interface, mutually identify knowledge gaps and jointly discuss scientific findings and potential solutions for policy and implementation. To address these aspects an online workshop was held in June 2022, as part of the Chinese-German cooperation on biodiversity and ecosystem services. It specifically brought together young scientists, as future leading researchers and decision makers. Apart from a number of specific suggestions made during the workshop, more general recommendations highlight the importance of interdisciplinary and landscape-wide research with regard to climate and biodiversity and the need to consciously manage the time gap between receiving research results and introducing policies.

Keywords: climate change; biodiversity loss; young researchers; China

1 Rationale and background

The interconnectedness of biodiversity loss, climate change and other environmental stressors is increasingly being recognised by scientists and decision-makers. This calls for **multipurpose solutions that support climate change adaptation and mitigation, conserve biodiversity and foster the recovery of ecosystems** (Pörtner et al. 2021). In this context science has an important role to play in better understanding ecosystem functions and to offer support for developing and implementing successful policies. A strong scientific knowledge base and a well-functioning science-policy interface are crucial to support policy makers and practitioners to act for climate and biodiversity (Seddon et al. 2020).

The Convention on Biological Diversity (CBD) and the United Nations Environment Programme have recognised the potential contribution of ecosystem-based approaches[1] and nature-based solutions (NbS)[2] for maintaining and enhancing ecosystem functions and services and achieving global climate, biodiversity and sustainable development goals. This has also been manifested in the Kunming-Montreal Global Biodiversity Framework (GBF) adopted by the 196-member states of the CBD in December 2022. In this context, ecosystem-based approaches, NbS and the GBF provide important tools and support to generate positive outcomes for climate and biodiversity. This policy brief was developed from an online workshop, held in June 2022, as part of the German-Chinese cooperation on biodiversity and ecosystem services. The workshop specifically addressed young researchers from both countries, in their future capacity as leading scientists and decision-makers. **This policy brief aims to raise awareness for the importance of a well-established science-policy interface** to better address the challenges emerging from the climate and biodiversity crises globally.

Chapter 2 provides an overview of recent policy developments with relevance for biodiversity and climate in China and Germany. Chapter 3 highlights the interdependence between climate and biodiversity, focussing on forest and urban ecosystems and identifies key gaps and needs for strengthening the science-policy interface. Chapter 4 provides recommendations for research institutions, and scientists to enhance interdisciplinary research collaborations (specifically among young researchers) and for funding bodies to improve researcher's access to funding with regard to the biodiversity-climate nexus.

[1] In the absence of an internationally agreed definition, but on the basis of publications and public debates that emerged since the 1990s, especially in the CBD context, the authors understood ecosystem-based approaches as follows: processes and means to achieve natural solutions that safeguard biodiversity, ensure ecosystem functioning and reduce climate change impacts, as part of overall conservation, mitigation, and/or adaptation strategies. Such approaches account for the important interactions between ecosystems, climate and livelihoods and aim to foster multiple environmental, societal, economic and cultural co-benefits for communities.

[2] UNEA 5.2 Resolution defines the concept of NbS as: actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits.

2 Recent policy developments for biodiversity and climate in China and Germany

2.1 China

China has **longstanding policies to manage natural resources and ecosystems**. The shelter forest projects, for example, have long been a pillar of the government's ecosystem restoration programme. More recently, programmes, like the 'Red Line of Ecological Protection' aim to address both climate mitigation and nature protection (Qi & Dauvergne 2022a). Furthermore, **NbS are being integrated into national policies** (some with considerable international impacts on global climate governance), like the Belt and Road Initiative and China's 2021 'Guiding Opinion' for climate action and environmental protection. The latter mandates subnational governments to utilize the general principles of NbS to protect biodiversity, restore ecosystems and mitigate and adapt to climate change (Qi & Dauvergne 2022a; 2022b). China's carbon peak and neutrality goals have driven actions across different sectors, like enhancing carbon sink capacity through ecological protection and restoration. At the ecosystem level China has developed laws, regulations and strategic plans and programmes supporting the implementation of biodiversity and climate measures. For example, by adopting protection and development plans and/or laws for forests, wetlands and grasslands and developing guidance for restoration in urban and marine ecosystems (MFA, 2020).

Nevertheless, **multipurpose solutions like NbS have yet to be fully mainstreamed into environment and climate action**. Only 2 of 16 major Chinese environmental policies released between 2019 and 2021 refer to NbS as a guiding principle or implementation measure and there is a lack of a unified management mechanism (Qi & Dauvergne, 2022a). Furthermore, **capacity building and public participation would help to strengthen to scale up effective approaches**. This also requires clear definitions of NbS and guidelines for implementation standards (Qi & Dauvergne 2022a; Yan et al. 2021). Research can address these needs by offering science-based knowledge and systematic approaches and solutions for decision-making and implementation.

Figure 1: Wetland area in Haidan, Beijing (Sofia Wang, Unsplash)

2.2 Germany

With the announcement of new, substantial funding programmes in 2022, **Germany has provided a basis to considerably enhance synergies between climate and biodiversity policies and action**. Most notably through the 'Federal Action Plan on Nature-based Solutions for Climate and Biodiversity' which highlights key issues and fields of action, supported by an unprecedented funding programme to benefit climate change adaptation and mitigation, and biodiversity conservation and restoration. Implementation-oriented research, interdisciplinary collaboration and knowledge-sharing are highlighted as critical components (BMUV, 2023).

Like China, Germany has also developed ecosystem-specific strategies, like the 'Federal Peatland Protection Strategy', aiming to contribute to the protection of biodiversity in peatlands and maximise resulting climate benefits. Voluntary action and financial incentives are key instruments to rewet peatlands and reduce emissions. In the urban context Germany has developed future-oriented

policies and programmes to support green infrastructure development, like the 'Federal Green Infrastructure Concept', the 'Urban Nature Masterplan' and the 'Federal Programme for the Adaptation of Urban Environments to Climate Change'. NbS are an important component of international and bilateral cooperation, e.g. within the International Climate initiative (IKI), which supports the global ecosystem-based adaptation fund and the implementation of climate and biodiversity interventions worldwide.

Although there are successful implementation examples locally**, scaling up mechanisms to strengthen climate and biodiversity synergies at all governance levels and across sectors is still a challenge.** With knowledge gaps persisting, e.g. on the climate mitigation and adaptation potential of different restoration measures (Kopsieker et al. 2021), these mechanisms cannot be developed without the strong support from science.

3 Ecosystem-based research: selected findings, gaps and needs

Globally, scientific support for evidence-based decision-making for climate and biodiversity has been advancing. For example, through research projects and programmes that aim to improve the knowledge base on ecosystem functioning and the response of ecosystems to stressors. However, **climate change impacts on ecosystems are often difficult to comprehend and even more difficult to quantify**, due to the complexity of ecosystems, the interactions of their components and the different contexts in which they occur.

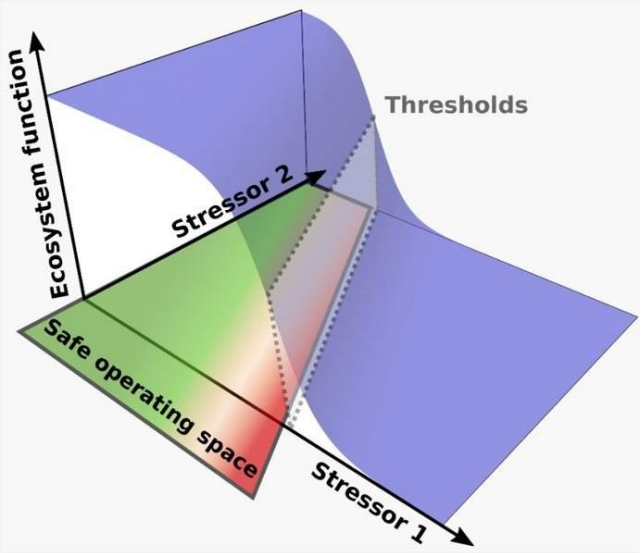

Figure 2: Stressor-ecosystem function responses. Thresholds define the point where the function is most sensitive to changes in stressor intensity (Source: Ulrike Scharfenberger, UFZ)

3.1 Selected advancements and findings: examples from urban and forest ecosystems

Research findings on urban green infrastructure development show the **importance of including multiple ecosystem services in urban planning**, to assess ecosystem service delivery and potential trade-offs and synergies of actions. This requires careful consideration of the spatial distribution of ecosystem services to maximize their positive impacts on the environment and peoples' health and wellbeing. The IMECOGIP project (Implementation of the Ecosystem Service Concept in Green Infrastructure Planning) has made significant progress in implementing the ecosystem services concept in green infrastructure planning in German and Chinese megacities (Zepp et al. 2021). Pilot studies in the metropolis Ruhrgebiet (Germany) and Shanghai (China) were used to apply practice-oriented research and develop methods to analyse ecosystem services in urban areas. A toolbox is being developed to explain functions, methods and technical features to users in administrations, politics and science to support the development of green infrastructure beyond the pilot regions. Furthermore, IMECOGIP combines the expertise of scientists from various disciplines in a science-policy dialogue developed as an interdisciplinary collaboration and exchange format.

Figure 3: IMECOGIP - Implementation of the ecosystem service concept in green infrastructure planning to strengthen the resilience of the Metropole Ruhr and Chinese megacities.

In forest ecosystems various Chinese-German collaborations and platforms (e.g. TreeDi, Biodiversity-Ecosystem Functioning Experiment China Platform) have made progress in understanding the interconnectivity of pressures and the relationships between biodiversity and ecosystem productivity. For example, findings show that there are **positive effects of species richness on carbon stocks and higher biodiversity can increase ecosystem stability** in climatically extreme years. Furthermore, scientists have enhanced the understanding of pathways for ecosystem functioning, for example, by showing how diverse forests can result in increased stability and productivity compared to less diverse forests (Schnabel et al. 2019; Schnabel et al. 2021). For soil organic carbon changes post-afforestation, the previous land use, climatic zones, forest type and forest age are key influencing factors (Guo et al. 2021).

3.2 Challenges, gaps and needs for the science-policy interface

Despite these increasing scientific insights (section 3.1), gaps and needs remain, that hinder policy-making processes and subsequent implementation of biodiversity and climate action.

For example, the implementation of green infrastructure in regional and local planning remains challenging because often **new regulations are not institutionalised and planners and mangers tend to adhere to established paradigms** and planning routines. Additionally, adapting acquired knowledge and methodological skills to practical requirements remains difficult and there is still a **lack of basic data** which can be used as a baseline (Zepp et al. 2021). In forest and below-ground ecosystems, lacking data also remains a key challenge. Especially data on the effects of biodiversity on ecosystem functioning pathways and climate change (and vice versa) remains insufficient. Furthermore, although valuable datasets exist at the site level, there is a significant **data gap at the landscape scale**, which makes forest management, especially considering possible future effects of climate change, difficult (Schnabel et al. 2021).

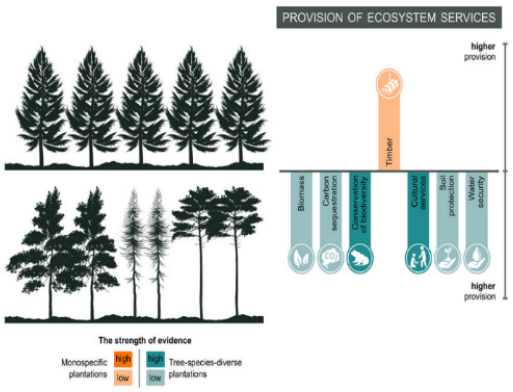

Figure 4: Provision of key ecosystem services between monospecific (top) and tree-species-diverse plantations (bottom) (Messier et al. 2022).

More broadly, for researchers working at the climate-biodiversity interface there are limited interdisciplinary platforms to enhance exchange and collaboration among scientists and decision-makers and institutional barriers (in and among research institutions, across multilateral environmental conventions or national ministries) have resulted in misaligning expectations, timelines and requirements, both at national and international levels.

Additionally, the **potential benefits from the results of research are not fully understood or valued** by different governance levels and across societal groups. This is enhanced by shortcomings to identify policy relevant research findings and to communicate them to decision-makers appropriately, which can lead to a **lack of understanding of the role and potential of**

science in policy making i.e. a mismatch between policy makers and researcher's expectations.

Lastly, although progress has been made in extending the knowledge base on climate and biodiversity interlinkages and developing the need to implement multipurpose solutions, the upscaling of multipurpose solutions, like NbS, and ecosystem-based approaches across scales and sectors (UNEP, 2022) remains challenging.

4 Lessons learned for a successful science-policy interface

The following recommendations (sections 4.1 and 4.2) were developed from the discussions among the workshop participants. The recommendations address the question: How can the science-policy interface be strengthened to inform policy making and implementation for climate and biodiversity, while recognising the valuable role research plays?

Interdisciplinary research cooperation is especially crucial for policy design, as it facilitates the analysis of issues and problems from the viewpoint of different disciplines. In an ongoing process, important knowledge gaps need to be identified and filled to improve the understanding of the feedback mechanisms (as described in chapter 3). However, due to the urgency to protect the natural basis of life and avoid further harm, **strategies and policies often need to be developed in parallel**. In this regard, the time gap between the generation of research findings and the development and implementation of policies is and will remain a challenge for both science and policy. Therefore, a close liaison and a well-developed interface is important.

Hence, **research for policy design should be embedded in policy making and testing processes**. Pilot studies can strengthen the evidence base and communicating initial results, practical findings, or best practices derived from research beyond the research community, bridges the science-policy gap. In some instances, as a co-benefit private investment can be attracted to initiate implementation. Yet, successful means of communication between science and policy need to be further developed. New digital technologies can provide opportunities in this regard.

Box 1. Recognising the potential of young researchers

The role and contribution of young people is increasingly being recognised by society or institutions (e.g. Fridays for Future, IUCN Youth Strategy) including multilateral environmental agreements (e.g. Global Youth Biodiversity Network under the CBD). Hence, there is momentum to transform classical procedures for applied research into being more policy relevant, for example by demonstrating to young scientists (who are also future leading scientists and decision makers) the importance of a sound science-policy interface for developing and implementing policy solutions. This is of specific relevance to the climate-biodiversity nexus. Most of all a mindset shift towards interdisciplinary, solution-oriented research is required. And as environmental problems today cross continents and borders international research relations are crucial to learn from different backgrounds. There are a range of well-established programmes which young researchers can build on to join forces, with the support of funding bodies and policy makers. To broaden the network and be more inclusive and globally relevant, the integration of representatives from different countries and continents is important. New approaches to exchange and cooperate online emerging through the COVID-19 pandemic offer new avenues for this. Examples of existing networks and collaborations supporting young

researchers and international exchanges are: Young Ecosystem Services Specialists Network (YESS) under the Ecosystem Services Partnership; Chinese Ecosystem Research Network (CERN); and the Sino-German Agricultural Centre (DCZ) Partnership.

4.1 Enhancing collaboration, networking and communication

The following specific recommendations are suggested, primarily to be **addressed by research institutions, scientists and policy designers**:

- Encourage long-term triangle partnerships between decision-makers, scientists and other stakeholders to enable knowledge sharing and the more collaborative development of research and policies.
- Develop bilateral and multilateral research collaborations on the biodiversity-climate nexus, to foster exchange between scientists and policy makers and benefit from other country's experiences.
- Implement joint interdisciplinary projects across continents (learning from each other), especially involving young researchers (Box 1).
- Support the meaningful engagement of indigenous peoples and local communities (solving problems through local knowledge and engagement, transdisciplinary research) at all stages of research implementation i.e. design, planning, implementation and evaluation.
- Link concepts like NbS and ecosystem-based approaches to other relevant concepts and processes, to integrate multipurpose solutions into existing policies, while highlighting the linkages to societal needs.
- Ensure that mechanisms to scale up local research findings and to communicate requirements from the national scale to local actors exist and vice versa with regard to policy design. For example, by establishing appropriate exchange mechanisms between local and national scale stakeholders.
- Utilise lessons learned from the COVID pandemic, including the use of digital networking opportunities to strengthen relationships across geographical and sectoral boundaries.

4.2 Fostering access to funding

As funding remains a major obstacle for the implementation of a successful science-policy interface, recommendations for **funding bodies and decision-makers** include:

- Increase awareness of funding opportunities to foster research and talent support for policy development and implementation. This also requires regular exchanges between funding seekers (with a strong focus on young scholars) and funding providers to ensure funding agencies are continually adapting to the needs of researchers and decision makers.
- Facilitate easier access to suitable sources of funding, especially for NbS projects, for example by publicising funding opportunities more widely and simplifying the application procedures.
- Foster coordination between different funding mechanisms and processes for example, by ensuring timelines complement each other to prevent gaps in funding that could halt research.

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