



Federal Agency for  
Nature Conservation

# Nature Conservation and Transformative Change

The role of nature conservation  
in social-ecological transformation

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VIEWPOINT



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## **Nature Conservation and Transformative Change**

### **The role of nature conservation in social-ecological transformation**

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## Key messages

Securing a future worth living requires a social-ecological transformation – a fundamental change in relationships with nature, of which we are a part, but also in relationships between humans. Such a change requires a different understanding of what constitutes a successful life and a desirable future.

The BfN supports and provides concepts for a social-ecological transformation - or transformative change - that envisages a fundamental rethinking in the areas of economy, society, politics, and technology; it also envisages a change in individual lifestyles within planetary boundaries in order to counteract the loss of biological diversity and its effects on humanity.

Important transformation areas in nature conservation are a change in consciousness and values, international cooperation, digitalization, biodiversity and climate change, conservation and restoration of ecosystems, food systems, production and consumption, urban transformation, and green infrastructure. On the one hand, nature conservation can make a specific contribution to the implementation of transformative change; on the other hand, fundamental changes are required in these areas in order to maintain planetary boundaries and thus to also preserve biological diversity.

The overarching goal of social-ecological transformation includes three dimensions for the work of the BfN:

- **Transformation OF nature conservation:** Nature conservation must reflect its contribution to transformative change and, thereby, continually question the self-image of nature conservation actors when implementing measures. Concepts must be developed that make the best possible use of synergy potential and manage conflicts of interest through acceptable and sustainable compromises without one-sided prioritization.
- **Transformation THROUGH nature conservation:** Transformative change without nature conservation is unthinkable. With its variety of measures, nature conservation is an intrinsic part of development within the planetary boundaries; it also provides important impetus for the successful implementation of such a transformation in fields of action beyond (classic) nature conservation.
- **Transformation FOR nature conservation:** Nature conservation must be at the centre of all transformation efforts as one of the priority goals and not as a sideshow. This requires cross-departmental approaches to solutions in the sense of policy integration, in which the drivers of biodiversity loss are directly addressed. At the same time, a change in social values and actual action towards a more nature-friendly way of life must be consistently promoted. Nature conservation can help shape such social transformation.

The development of the new **National Biodiversity Strategy (NBS) 2030** and its action plans is a key opportunity to drive profound, transformative change to achieve the long-term goals and vision of the new Kunming-Montreal Global Biodiversity Framework (GBF).

A social-ecological transformation can only succeed with “less” land, energy and material consumption, to preserve human livelihoods and our natural life support system. Nature conservation can promote convincing **narratives** and convey nature-friendly visions of the future.

Only through an inter-departmental, cross-sector, whole-of-society, and integrated approach can transformation pathways be developed within planetary boundaries.

## 1 Introduction

The massive decline in biological diversity and rapidly advancing climate change are among the greatest challenges of our time. Both crises are man-made and halting these trends has not been successful in recent decades. It is undisputed that simply pursuing “business as usual” is not possible without destroying our natural life support system. Securing a future worth living requires a social-ecological transformation, or transformative change – a fundamental change in relationships with nature, of which we are a part, but also in relationships between humans.

Such a fundamental change in our social relationship with nature must encompass changes towards sustainability in a wide range of political, economic and social areas. Political decisions and the way we produce and consume must fundamentally be re-evaluated based on their impact on nature and aligned with planetary boundaries. It will be pivotal to develop a positive vision of a good life within planetary boundaries, in order to initiate and support transformative change towards a more sustainable society. In addition, social structures that, for example, deepen grave inequalities need to be better understood in terms of their impact on the crises mentioned and must be actively reshaped. Such far-reaching changes require strong political will that goes beyond individual departments, openness to fundamentally new approaches, and a high level of ambition right from the start.

Against this background, the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) calls for “a fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values” to halt biodiversity loss (IPBES 2019). Numerous publications and political strategies underline the urgency of transformative change to maintain planetary boundaries and, thus, to also preserve biological diversity as the basis of life for all of us. These include the report of the German Advisory Council on Global Change (WBGU 2011), United Nations Agenda 2030 (UN 2015), the Special Report of the Intergovernmental Panel on Climate Change (IPCC) (IPCC 2019), the EU Biodiversity Strategy for 2030, and the “Theory of Change” of the Kunming-Montreal Global Biodiversity Framework (GBF). Consequently, transformative approaches should also be strengthened in the new edition of the National Biodiversity Strategy (NBS 2030).

The Federal Agency for Nature Conservation (BfN), as the national nature conservation authority, expressly supports the call for such a comprehensive transformative change and, in particular, emphasizes the high urgency for its implementation (see Bundesregierung 2021). This BfN paper presents perspectives on how changes in nature conservation can promote a social-ecological transformation and what role the implementation of the new NBS plays in this. In addition, it showcases examples where nature conservation provides important guidance and impetus for successful transformative change. The final conclusion summarizes key demands for political and social change.

## 2 Nature conservation and transformative change

Nature conservation is a collective term for very different measures that contribute to the preservation, restoration, or sustainable use of nature or biological diversity. This is worth protecting for its own sake; yet biodiversity also forms the basis of human life, health, and social and economic activity (IPBES 2019, Dasgupta 2021). For this reason, nature conservation is a whole-of-society task that affects us all. The diverse perspectives and interests of society, in turn, shape the design and acceptance of nature conservation. Nature conservation is, therefore, a cultural and science-based social agreement.

The relationship between conservation and transformative change is complex. On the one hand, nature conservation itself, with its variety of measures, makes an essential contribution to the realization of social-ecological transformation. On the other hand, nature conservation depends on fundamental changes, especially in sectors beyond the environmental department, in order to effectively address the causes of biodiversity loss and climate change associated with our unsustainable lifestyles and economies. Compliance with planetary boundaries and the preservation of our natural life support system must be recognized as a central goal across departments.

In order to specify the relationship between nature conservation and transformative change, three dimensions can be distinguished.

### **Transformative change OF nature conservation**

Nature conservation activities and nature conservation policy must be critically reviewed; to question what implications the call for transformative change has on how nature conservation understands itself and how it needs to adapt in order to promote such a transformation.

Previous concepts and approaches, as well as structures and processes in nature conservation must be examined to determine what their contribution to a transformative change is and how this can be further expanded, but also what obstacles exist and how they can be reduced. This requires an expansion of the understanding of nature conservation beyond ecological contexts (Berger and Schell 2022). Endeavours for one-sided transformative change which, for example, are intended solely to mitigate climate change and do not take into account effects on nature, are neither sustainable nor effective.

Fundamentally, aspects of systemic thinking, transdisciplinarity, synergies and alliances, and participation and distributive justice must be examined (see Box 1).

### **Transformative change THROUGH nature conservation**

On the basis of its objectives, nature conservation itself contributes directly to transformative change. Through its implementation, nature conservation not only provides important impetus for the necessary systemic changes with regard to the underlying causes of biodiversity loss; it is also intrinsically linked with and prompts interactions with social and economic issues, for example those relevant and required for the climate debate. Likewise, the concept of nature-based solutions for climate and biodiversity shows how addressing nature conservation and climate change together offers significant added value in the fight against both crises. To this end, in addition to “classic” implementation tools from nature conservation practice, a broad portfolio of approaches is researched, tested, and implemented through the Federal Action Plan on Nature-based Solutions for Climate and Biodiversity (Aktionsprogramm Natürlicher Klimaschutz – ANK). There are numerous examples of this in the following chapter.

To date, these contributions of nature conservation have not received enough attention in the context of transformative change.

### Transformative change FOR nature conservation

However, nature conservation and its contribution to transformative change not only requires linking common goals and negotiating compromises in contexts where political objectives and regulatory frameworks differ. It also needs concrete individual behavioural changes as well as limitations regarding current consumption and production practices. To this end, a change in social awareness must be promoted and, in line with transformative learning, capacities need to be strengthened regarding action skills and the ability to shape the future. In order to achieve the goals of biodiversity conservation, restoration and sustainable use, a transformative change is required, especially in the drivers that are causing the ongoing loss of biodiversity. This requires cross-departmental thinking and action.

#### Box 1: Methodological aspects of implementing transformative change

**Systemic thinking** has long been established in nature conservation in the form of the ecosystem concept. In addition, the analysis of the interactions between complex social, economic, and ecological systems makes their mutual interdependence clear (see Berger 2019).

A **transdisciplinary approach**, namely the combination of practical knowledge with interdisciplinary scientific findings, enables realistic and acceptance-building technical control of the diverse small steps necessary to bring about fundamental changes.

The nature conservation measures derived from this should be designed in such a way that, if possible, they strive for additional benefits beyond ecological contexts in the sense of **synergies and alliances** with other policy areas, especially in the area of climate change mitigation and adaptation, but also in economic or social policy.

At the same time, transformative change must not become socially explosive by placing a specific burden on already disadvantaged groups. Against this background, tendencies of populist or even anti-constitutional resistance must be monitored particularly carefully and averted. In order to counter such developments, it is essential to **involve the relevant actors affected in change processes at an early stage and to take into account considerations of fairness** (see WBGU 2020; Wittmer et al. 2021).



### 3 Transformation areas from a nature conservation perspective

In order to successfully implement transformative change, nature conservation must be consistently integrated into all areas of society. In the following, transformation areas from a nature conservation perspective are presented that should serve such an integration (see Wittmer et al. 2021, Wolff et al. 2018). This includes showcasing BfN activities that provide specific contributions to shaping a social-ecological transformation, as well as pointing out requirements for necessary changes.

#### 3.1 Changes in societal awareness and values

The massive endangerment of species and habitats (e.g. through changes in land or sea use, overuse or pollution) is the result of the way we produce and consume. Based on a so-called “colonial lifestyle,”<sup>1</sup> prosperity is defined primarily via economic growth. A social-ecological transformation requires an understanding of what constitutes a successful life and a desirable future, also taking into account the needs of future generations as well as the promotion of specific behavioural change.

At the same time, it is important to better understand and reduce the social reasons behind the increasing destruction of nature (see WBGU 2020). To this end, the BfN carries out (among other things) horizon scanning of socio-political discourses in order to identify and evaluate developments relevant to nature conservation at an early stage. As a social agreement and a whole-of-society task, nature conservation is based on collective negotiation processes. It is important to promote individual awareness and knowledge about the consequences of one's own behaviour, as well as to further strengthen nature conservation arguments in social discussions through communication that is appropriate to the target group. The basis for this is provided by representative population surveys as part of the Nature Awareness Studies, which, every two years since 2009, have been examining changes in nature awareness, values, attitudes and willingness to act (e.g., BMUV & BfN 2023).

With a view to the need for transformative change, the current Nature Awareness Study by the BMUV and BfN (2023) shows a clear willingness to contribute to such a social-ecological transformation. Specifically, 86 per cent of those surveyed are of the opinion (with varying levels of emphasis) that comprehensive change is necessary to stop the global nature, environmental, and climate crisis; many also express a personal willingness to actively support this change through a sustainable and nature-friendly lifestyle (BfN & BMUV 2023). This willingness extends across all sections of the population and shows that society supports a commitment to more action on nature conservation and climate change mitigation.

However, the expressed willingness for lifestyle change does not equate to an actual change in behaviour. Deviations between beliefs and lifestyle – the so-called intention-behaviour gap – are particularly evident in socially and economically better-off groups. Reducing the discrepancy between intention and behaviour is also an important task for nature conservation in the sense of transformative change. With this objective, the BfN is pursuing a scientific evaluation and greater application of behaviour-oriented approaches in nature conservation. In this regard, cooperation and activities in the context of education for sustainable development (ESD)

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<sup>1</sup> “Colonial” because it is guided by the illusion of unlimited resources, land availability, labour, and waste sinks (Brand and Wissen 2018).

will be continued and further expanded, as also desired in the United Nations Agenda 2030 (UN 2015). The behaviour-oriented activities aim to translate consciousness into real action and – in contrast to simply imparting factual knowledge – better understanding of the connections between an individual’s actions and effects on nature / the world, imparting "how-to-knowledge" and promoting an ability to shape the future in order to enable transformative learning. The BfN has already pursued a strengthening of this behaviour-oriented approach with the newly created NBS social indicator "Awareness of biological diversity" (Bamberg et al. 2023). The BfN also promotes the further expansion of environmental psychology and behaviour-oriented expertise to promote social transformative change as part of the "Summer School Environmental Psychology" that takes place on the Isle of Vilm every two years (Reese et al., 2023).



Figure 1: Nature experiences for all people as an important prerequisite for appreciation and an appropriate interaction with nature (Photo: B. Schuster)

Socially disadvantaged people are often detached from nature as an opportunity for experience, although research by the BfN shows that the need for contact with nature is also widespread in these population groups (Frohn et al. 2020). In the future, these milieus should be better targeted with low-threshold offers, for example in the form of leisure activities or experience-based educational activities. Consideration of social issues in nature conservation is an important prerequisite for social acceptance of nature conservation measures (Berger 2021, Frohn and Wichert 2018). By promoting specific nature experiences for everyone, the scientifically proven added values of nature for health, well-being, and happiness can be achieved in practice (see, i.a., Schloßberger 2015, Gebhard and Kistemann 2016).

Fundamentally, it is important to succeed in promoting convincing narratives in order to jointly develop and convey emotionally appealing, nature-friendly visions of the future that invite participation and do not act as a deterrent.

### 3.2 International cooperation

International collaboration is crucial for transformative change. Nature knows no political boundaries, and the causes of global biodiversity loss, climate change, and other global crises can usually only be understood and dealt with in an international context.

Therefore, international environmental agreements and programmes, as well as EU environmental law, play an important role in setting ambitious common goals, specifying mechanisms for (national) implementation, and creating a binding framework for international cooperation. The new Global Biodiversity Framework of the Convention on Biological Diversity, for example, includes 23 targets, many of which directly address the drivers of biodiversity loss, and is therefore guiding the way for a global social-ecological transformation. In the EU, the EU biodiversity strategy for 2030 also sets goals for transformative change.



Figure 2: Adoption of the Kunming-Montreal Global Biodiversity Framework.  
(Source: United Nations Convention on Biological Diversity)

Cooperation between individual countries and within European and global networks is also crucial at the specialist level in order to bring together data and expertise, network actors, exchange experience, and jointly develop and advance transformative solutions. To this end, with its scientific reports the IPBES offers a global knowledge base on the causes of biodiversity loss and connections to other global challenges. In addition, IPBES and the Convention on Biological Diversity have provided important impetus for a transformative change in nature conservation. These include, for example, the greater focus of nature conservation goals and efforts on the diverse values of nature and its services for society, as well as the emphasis on a whole-of-society and whole-of-government approach. Furthermore, questions of distributive justice, the recognition of rights for indigenous peoples and local communities, as well as inclusion (participation) are emphasized in the context of sustainable biodiversity protection. An IPBES report on transformative change is currently being prepared.

A focus of the BfN's international work is the transdisciplinary exchange of knowledge and experience, as well as the development of capacities together with partners from various countries. Through research and development projects, as well as international conferences and training courses at the BfN's International Nature Conservation Academy Isle of Vilm, which deal with globally important topics such as synergies for nature and climate change, the BfN contributes to the further development of global discourses and solutions and contributes to strengthening capacities for transformative change. In partner countries, the BfN works on numerous projects with governmental and non-governmental actors at various levels in order to jointly make transformative contributions to the implementation of international nature conservation goals.

The BfN will continue to promote social-ecological transformation as an international task in the future. There is still a lot of work to be done in the assessment, communication, and systematic consideration of global interconnections and global biodiversity impacts in relevant decision-making processes, in the ambitious design and implementation of international nature and environmental protection agreements, as well as in the promotion of international exchange of knowledge and experience, capacity building, and cross-border cooperation.

### 3.3 Digitalization

Transformative change cannot be viewed without the topic of digitalization. The term digitalization does not mean purely technical aspects, but rather comprehensive socio-technical aspects. The numerous developments and enhancements of digital methods, applications, and processes over recent decades have fundamentally changed how we live, work, and do business. At the same time, social values and economic circumstances determine the direction of digitalization. Digitalization acts as an accelerator for social change via its ability to quickly open up new fields of application, accelerate processes, and increase efficiency. For this reason, people often talk about “digital change” or “digital transformation,” which in itself is considered a megatrend (WBGU 2019).

The connections between digitalization and ecological sustainability have been increasingly discussed in recent years (e.g., see Göpel et al. 2019, Jankowski et al. 2023). The relationships are considered so close that they are sometimes referred to as twin transitions. At the political level, among other things, the Digital Policy Agenda for the Environment was published in 2020, as well as the conclusions of the European Council on digitalization for the benefit of the environment.

In order for a digital transformation to contribute to the social-ecological change of society, the ecological footprint of digitalization itself must first be reduced (keywords: green IT, digital sufficiency). Furthermore, it is crucial to proactively evaluate, design and – if sensible – use technologies more widely for areas of common good, such as nature conservation work. Digitalization is a relevant interdisciplinary topic for all specialist areas of nature conservation: for example, optical and acoustic sensors record important data relevant to nature conservation; machine learning methods can be used, among other things, for status and trend analyzes of species and ecosystems as well as their influencing factors, and networked data infrastructures and practically-oriented specialist software make it easier to implement official enforcement tasks. In addition, recording apps and nature observation portals are becoming increasingly important for professional organisations and citizen science, while apps, social media, virtual and augmented reality, among others, can contribute to educational and public

relations work. In order to actually take advantage of all these opportunities of digitalization, resources and capacities are necessary, as well as interdisciplinary and flexible forms of collaboration (Davis, Mrogenda, Schneider 2023).

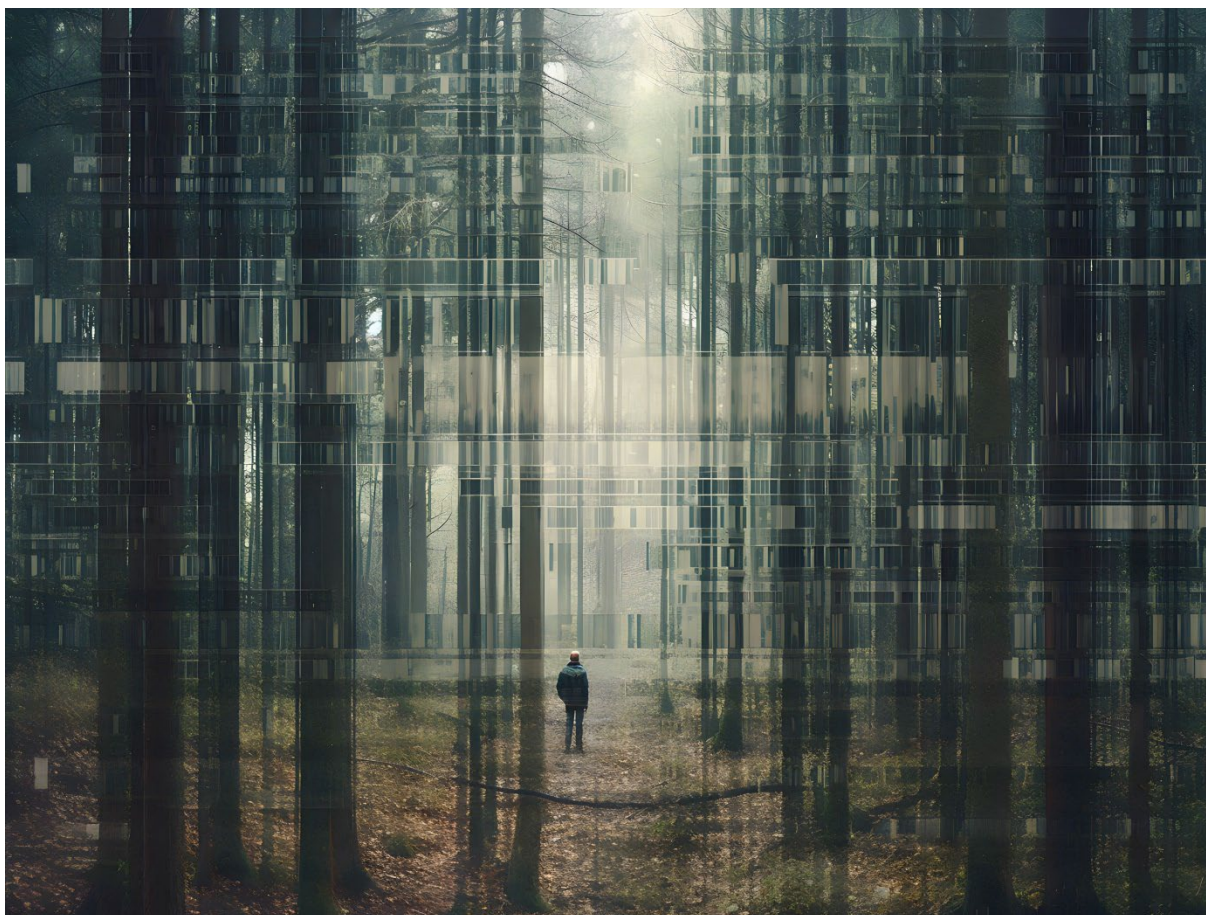


Figure 3: Does sustainable digitalization exist? (Photo: corlaffra/stock.adobe.com)

However, digital developments must not lead to an intensification of unsustainable economic practices and unsustainable patterns of consumption and perception. On the contrary, digitalization should be designed in such a way that the direct and indirect negative effects of all economic and social sectors on biological diversity are prevented or significantly mitigated. Without digitalization that consistently takes into account nature conservation concerns and planetary boundaries, achieving global or national nature conservation goals is unthinkable. At the same time, a social-ecological transformation of society is the basis for sustainable digitalization. To support this, those working in nature conservation should become more involved in overarching digitalization discourses and actively shape digital change. Research should also examine in more detail the often indirect connections between digitalization and nature conservation in order to identify possible risks and make evidence-based recommendations for action in the interests of nature conservation.

The BfN is paying increasing attention to this field of action. Nationwide nature conservation-related data and knowledge are being collected and networked in order to ensure the necessary knowledge base on the subject of nature to enable transformative change. Diverse environmental information systems enable the state of biological diversity in Germany to be recorded, assist the performance of legal enforcement tasks, and improve the public availability

of environmental information (Schneider et al. 2021). In addition, the BfN promotes applied research and creates exchange formats to increase knowledge and collaboration on topics related to digitalization and nature conservation (Davis, Mrogenda, Schneider 2023).

The trend of digitalization must and can also be actively shaped by the nature conservation community towards a social-ecological transformation. On the one hand, more resources should be invested in digital projects that strengthen sustainable, public-interest-oriented economic and consumption practices and avoid negative impacts on nature, the environment, and society. On the other hand, the nature conservation community should promote needs-oriented digital developments through cooperation that supports effectively and long term practical nature conservation work. Despite their great potential, digital methods and tools can only ever contribute to a solution – unrealistic expectations or false hopes for “saving technologies” must under no circumstances delay action in the interest of nature conservation on the part of politicians and business. This also applies to other, converging technological developments, such as synthetic biology (BfN 2022d).

### **3.4 Addressing biodiversity and climate change together**

In 2021, the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Panel on Biodiversity (IPBES) published a joint report for the first time in their history (Pörtner et al. 2021), which convincingly conveys that advancing climate change and the ongoing decline in biological diversity are inseparably connected. The consequences of these two crises are already being felt in Germany. Protection of biological diversity, climate change mitigation as well as adaptation to climate change, must therefore be considered together and addressed through common, sustainable solutions.

With the change to the Federal Climate Change Act, the target of German greenhouse gas neutrality was brought forward to 2045. One component with which this goal is to be achieved is the massive expansion of renewable energies (RE). To ensure that this does not come at the expense of biological diversity, the effects on species and habitats must be taken into account at an early stage in individual cases when determining the expansion paths and the choice of location. Protective measures at energy facilities and other measures as part of the National Species Aid Programme (Nationales Artenhilfsprogramm - nAHP) are intended to support affected species. Whether these measures are sufficient is questionable given the expansion goals of the Renewable Energy Sources Act. One-sided prioritization of climate change mitigation that does not take nature conservation concerns into account should be rejected. This is because unilateral prioritization of one of the two “twin crises” does not lead to a sustainable solution in the long term in the sense of planetary boundaries. Instead, it promotes an unbalanced transformative change that only takes one-sided concerns into account.

In addition to the expansion of RE and other technical climate measures, nature-based solutions also play an important role in mitigating and adapting to climate change. Nature-based solutions for mitigation of climate change form a bridge between nature conservation and climate change mitigation by strengthening the natural function of intact ecosystems to store greenhouse gases in the long term.



Figure 4: Semi-natural river landscapes, like here on the Elbe, are habitats for many animal and plant species. They also act as greenhouse gas sinks and improve flood protection. (Photo: B. Neukirchen)

For example, a drained peatland releases large amounts of greenhouse gases that have been bound by peat-forming plants over thousands of years. A wet, more natural peatland, on the other hand, is a carbon store and at the same time a habitat for animals and plants typical of this ecosystem (Rosinski et al. 2021). By upgrading entire habitats, measures implementing nature-based solutions for climate and biodiversity can also increase the resilience and adaptability of people and nature to further climate changes. Natural measures to retain water in the landscape can counteract the increasing risk of floods, flash floods, and droughts and, at the same time, strengthen biological diversity, reduce harmful substances entering water bodies, and contribute to people's recreation.

Nature-based solutions for climate and biodiversity can only be effective on a large scale if local actors can be won over to implement appropriate measures. Intensive participation processes, such as the adoption of the Federal Action Plan on Nature-based Solutions for Climate and Biodiversity (see Box 2), are therefore important for any implementation concepts. Forests, floodplains, peatlands, soils, seas, and water bodies can be hotspots of biological diversity if nature is given sufficient space; at the same time, they can make indispensable contributions to climate change mitigation and prevention of the consequences of climate change.

#### Box 2: Federal Action Plan on Nature-based Solutions for Climate and Biodiversity

**What is the aim of the Federal Action Plan on Nature-based Solutions for Climate and Biodiversity (Aktionsprogramm Natürlicher Klimaschutz – ANK)?** The Federal Government's ANK creates and strengthens natural greenhouse gas sinks and is therefore an important milestone on the path to the target of Germany being greenhouse gas neutral by 2045. To this end, the general condition of nature in Germany should be significantly improved, with ecosystems on land and in the sea becoming more natural, more structurally diverse, and more resilient. More sustainable agriculture and forestry should also leave more room for a more diverse flora and fauna on cultivated areas. Simultaneously, the ANK should also contribute to precautions against the effects of climate change. For example, a more natural water balance protects against droughts and floods, which are becoming more likely and more intense as a result of climate change (BfN 2022a).

**What measures does the ANK include?** At the core of the ANK are the financing of restoration measures as well as financial incentives for conversion to nature-friendly and climate-friendly forms of management. The ANK includes all the necessary steps to protect and strengthen ecosystems. These range from recording the condition of ecosystems and

researching the causes of their degradation, developing suitable countermeasures, and building the skills necessary for the permanent implementation of measures and monitoring of their success.

**What does the ANK mean for nature conservation?** The ANK strengthens the role of nature conservation by providing common solutions for the twin crises of biodiversity loss and climate change. Among other things, peatlands should be rewetted, forests protected, floodplains and salt marshes restored, soil functions sustained, and urban nature strengthened. Up to four billion Euros from the climate and transformation fund are available for this purpose until the end of 2026. In order for nature-based solutions for climate and biodiversity to have a long-term effect and for the ANK to contribute to sustainable development in society, important steps must now be taken to develop tailor-made financing instruments and maximize the use of synergies with other national and international programmes and goals for climate change mitigation, climate change adaptation, and biodiversity conservation.

### 3.5 Conservation and restoration of intact and diverse ecosystems

All over the world, habitats on land and in the sea are being destroyed, the naturally predominant diversity of forest landscapes has largely disappeared or been converted, and open landscapes are heavily affected by intensive use. Up to one million plant and animal species are threatened with extinction (IPBES 2019). In Germany, almost two thirds of all habitat types are endangered or are threatened with complete extinction (Finck et al. 2017) and almost one third of native wild plants are on the Red List of Endangered Species (BfN 2018). Animals such as European hamster, arctic tern, and harbour porpoise are in danger of disappearing completely. Formerly established species such as European mink and common skate have already disappeared. This can have cascading effects on ecosystem functions and lead to abrupt and sometimes irreversible changes (Scherber et al. 2010).

The conservation and restoration of damaged ecosystems and the repopulation of endangered species are central goals of nature conservation. According to the international standards set by the Society for Ecological Restoration (SER), restoration can include a wide range of activities that society can undertake to remedy damage to the environment. Via the UN Decade for Ecosystem Restoration 2021-2030, the United Nations is calling for increased efforts to restore vital ecosystems. Together with the Federal Environment Ministry (BMUV), the BfN honours innovative projects as part of a project competition for the UN Decade and makes these best practice examples known to the public. This strengthens social awareness and stimulates further activities to restore ecosystems.

By approving the Kunming-Montreal Global Biodiversity Framework (GBF), Germany has committed to comprehensive goals for securing biological diversity, including the conservation and restoration of ecosystems. Among other things, it was agreed that 30 per cent of damaged ecosystems on land and in the sea should be restored by 2030. The planned adoption of the ambitious EU Nature Restoration Law represents an important milestone in giving a reliable legal framework to the efforts made so far. The current draft of the new EU Nature Restoration Law stipulates, among other things, that restoration measures should cover at least 20 per cent of the land and sea area in the EU by 2030. Germany will develop a comprehensive national recovery plan for this purpose in the next few years.





Figure 5: The brown hare is an endangered species in Germany because it depends on structurally rich cultural landscapes (Photo: CC BY-SA 3.0).

In our cultural landscape, which is largely characterized by human use, integrative approaches are crucial so that reaching sustainability in agriculture and forestry, fishing, energy, and raw material production becomes a common goal and transformative change can be implemented. In order to achieve the common goal of restoring our ecosystems, the responsibilities of various social groups must be consolidated and new ways of working together must be found.

A systemic approach is essential in which ecosystem processes, habitats, and species are considered together<sup>2</sup>. Using a systemic approach, the BfN promotes numerous restoration projects to conserve and restore habitats. For example, in the Bienwald large-scale nature conservation project in the Southern Palatinate, the unique nature of the Southern Palatinate and the last stream meadow forests in southern Germany were secured in the long term. In addition, enhancing the region's ecosystems also increased water retention in the landscape, thereby achieving better adaptation to climate change (BfN 2022c). The success of such projects also depends on the participation and support of society. Nature conservation can play the role of facilitator here by revealing synergies of ecosystem restoration with the conservation of ecosystem functions. The restoration of intact ecosystems and the conservation of ecosystem services such as natural climate regulation, protection against floods and soil erosion, or the provision of vital goods such as food, drinking water, fuel, and building materials also ensure our own survival.

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<sup>2</sup> The BfN rejects, for example, the synthetic biology approach of genetically modifying wild organisms to maintain or restore biodiversity, also for the reason that it does not sufficiently take into account the importance of ecosystem processes.

The complexity of ecosystem processes contributes to the fact that effects of genetic engineering interventions on wild organisms are difficult to estimate and the assumption of a possible benefit for nature conservation is speculative (BfN 2022d).

### 3.6 Promoting sustainable food systems

Over the last 70 years, the intensive use of natural resources for food production has led to a dramatic loss of animal and plant species and their habitats in Germany, Europe, and worldwide (Leopoldina 2020). Related inputs of nutrients, pesticides, and other (harmful) substances endanger the quality of air, soil, inland and marine waters, and even groundwater (Heißenhuber et al. 2015). This also puts food production itself at risk. Clear examples of this are excessively high catch quantities in combination with the climate change-related increase in average water temperature and, as a result, the collapse of stocks of important commercial fish species such as cod and herring in the Baltic Sea (ICES 2022a, b, c) or the loss of pollinating insects and the resulting threat of crop failures for important food crops (Reilly et al. 2020).

The so-called Western pattern diet is characterised, among other things, by an excess of calories per capita and a high proportion of animal products, which may be one of the reasons for the frequency of some so-called “diseases of civilization” (Cordain et al. 2005). According to the German Advisory Council on Global Change (WBGU, 2020), transformation of the global food system and global eating habits is required: “In particular, the animal product-heavy dietary styles of industrialized countries [...] increase land-related problems for climate change mitigation and biodiversity protection and make sustainable food security within planetary boundaries more difficult.” In contrast, there are almost a billion people worldwide who suffer from hunger because they have no or insecure access to food (FAO 2022).

Future food systems must use resources sustainably and protect natural communities and ecosystems. Food must not be wasted and the calories produced must be used as efficiently as possible. Every year around 11 million tons of food waste in Germany is thrown away that need not have been produced at the expense of the environment and biological diversity. It is therefore natural that both the GBF (CBD 2022) and the NBS 2030 include targets for reducing food waste.

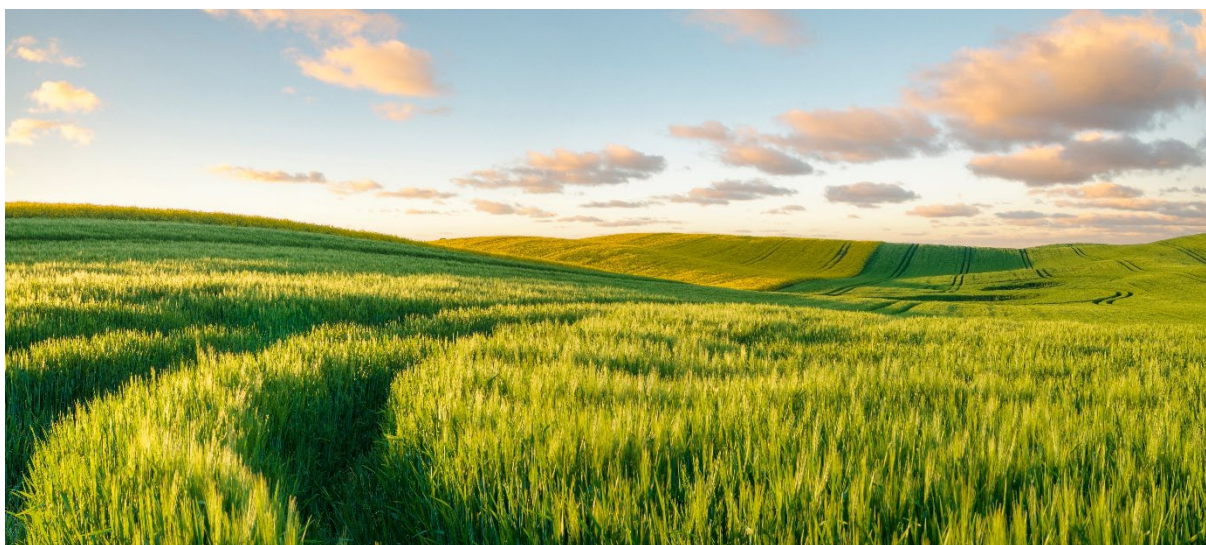


Figure 6: Even many of the animal and plant species that are adapted to farming practices can no longer find a suitable habitat in such featureless agricultural landscapes. (Photo: Mike Mareen/stock.adobe.com)

These goals are already anchored in various international, European and German strategies, such as the Convention on Biological Diversity (CBD) (CBD, 2022), the EU “From farm to table” strategy, the EU Biodiversity Strategy (EU Commission, 2020a), the Water Framework Directive (Dir. 2000/60/EC), the National Biodiversity Strategy (Bundesregierung, 2007), the Common Fisheries Policy ((EU) No. 1380/2013), and the Marine Strategy Framework Directive (MSRL 2008/56/EC). However, they must be further expanded and rigorously implemented by all relevant sectors and levels of action (political decision-makers, producers, processors, retailers, and consumers). The 2021 Nature Awareness Study (BMUV & BfN 2023) provides an indication of behavioural willingness in the area of nutrition, in which 69% of those surveyed stated that they would be willing to reduce their meat consumption.

In agriculture, more sustainable cultivation methods must be developed and promoted which are adapted to local conditions and sustainable water management, such as reduced tillage and expanded crop rotations based on adapted varieties. Agricultural landscapes must be enhanced and networked through a variety of natural and semi-natural habitats such as hedges and field edges. This diversity also makes agricultural cultivation systems more resilient to pests, diseases, and climate extremes. Animal husbandry, with the currently predominantly intensive farming systems, must be transformed and the number of animals must be adapted to the available area. Imported animal feed should be avoided. In Germany, the “Livestock Competence Network” (2020) and the “Commission on the Future of Agriculture” (2021) have developed two recommendations for social-ecological transformation paths in the agriculture sector in participatory processes. However, so far there has been a lack of consistent implementation of the proposals.

In fisheries, ecosystem-friendly fishing methods must be established that avoid bycatch of protected species and establish low-CO<sub>2</sub> fishing fleets. Fish stocks must be used sustainably within safe biological limits, taking into account rising water temperatures as a result of climate change and associated falling productivity (Scotti et al. 2022).

An example of a transformation in the food system are forms of organic farming, especially those that rely on regional cycles. By largely eliminating the use of chemical-synthetic pesticides and mineral fertilizers, the impact on the environment is significantly reduced. Nevertheless, organic farming can also very intensively affect nature and landscapes. This can be mitigated by nature conservation measures adapted to the farm context. The concept of organic farming has led to the creation of an entire food system led by producers, retailers, and consumers. It therefore represents not just an individual measure, but a real, transformative system change.

### **3.7 Responsible production and sustainable consumption**

Beyond food production, unsustainable production systems and consumption patterns are indirect drivers of global biodiversity loss. They represent underlying causes for the direct drivers, such as land use changes (e.g. deforestation of tropical forests for new cultivation or extraction areas), climate change, pollution and, in some cases, invasive species (Wittmer et al. 2021). To halt the rapid decline in biodiversity, it will therefore not be enough to just address the direct drivers. Rather, the underlying causes must also be addressed in the sense of a transformative change and sustainable, nature-friendly consumption and production patterns must be ensured. The world's population consumes 1.75 times the natural resources that our planet regenerates every year, and globally this overuse of natural resources is distributed

very unevenly. If the entire world population lived like the average person in North America, it would need 4.2 planet Earths; for the lifestyle in the European Union it would still be 3 Earths; whereas the value for Africa is 0.9 (Footprint Data Foundation et al. 2022). Current production and global consumption therefore exceed the biophysical capacities of the planet. Adhering to our prevailing economic practices and lifestyles will lead, in the long-term, to the destruction of our natural life support system. In particular countries like Germany, where lifestyle far exceeds the Earth's ability to regenerate, are faced with the challenge of a comprehensive change in consumption that focuses on a good life that is compatible with nature. Due to the global links between consumption and production systems, the severe impacts of our consumption on nature also specifically affect countries in the Global South (Kliem et al. 2019).



Figure 7: Opencast brown coal mining (Photo: corlaffra/stock.adobe.com)

In order to meet the above-mentioned challenges a goal of transformative change – from a nature conservation perspective – should be responsible production and sustainable consumption, in line with the conservation and restoration of global natural capital and associated ecosystem services for current and future generations.

Implementing this shift in production and consumption requires actors at all levels and in all economic sectors to do their part. Approaches at the political level include, among others, reducing and redirecting environmentally-harmful subsidies, establishing environmentally and biodiversity supportive incentives for sustainable and responsible production, creating awareness of the necessary change in our consumer behaviour, establishing criteria for nature-friendly public procurement, and reorienting financial flows towards biodiversity-promoting investments. The requirement for companies is that they assess, disclose, and resolutely reduce negative impacts on biodiversity along their global supply chains. With the help

of applied research, the integration of biodiversity into measurement methods (such as life cycle assessments and footprints) can create the necessary conditions for biodiversity-promoting decision-making – for politicians, businesses, and consumers. Private consumers, in turn, have the opportunity to jointly advance the production and consumption transition through conscious and sustainable purchasing behaviour. In the long term, there is a need for a social decoupling of the equalisation of a high quality of life with a constantly increasing material consumption, i.e. the promotion of sufficiency as the basis of a good, nature-friendly life.

### Box 3: Sufficiency

The Intergovernmental Panel on Climate Change (IPCC) defines sufficiency policies as “a set of measures and daily practices that avoid demand for energy, materials, land, and water while delivering human well-being for all within planetary boundaries” (IPCC 2022 - AR6 WGIII SPM). In the context of nature-friendly consumption, sufficiency means a change in consumption patterns that contributes to respecting the Earth's ecological limits while changing benefit aspects for consumers (Teufel et al. 2021). It is a question of “enough” and means moving away from overconsumption, which is damaging to nature and the environment. Promoting sufficiency-oriented lifestyles is an important measure for protecting biological diversity worldwide (Kliem et al. 2019).

The BfN is already providing a significant transdisciplinary contribution to making the effects of our production methods and consumption on biological diversity and ecosystem services visible as well as demonstrating options for action for nature-friendly production and consumer behaviour. This is done, among other things, through case studies, the provision of information materials for consumers, and the development of approaches to assess the biodiversity impact of products and services. In particular, international contexts are analyzed and biodiversity concerns are introduced into relevant global policy processes, including in cooperation with the One Planet Network for sustainable consumption of the United Nations Environmental Programme. The BfN is also involved in the development of sustainable prosperity indicators and in raising awareness of subsidies that are harmful to the environment, as well as in the development and introduction of alternative economic instruments that promote biodiversity. Other central contributions of the BfN are the creation of whole-of-society awareness and commitment to preserving the diverse values of nature and their associated services. Examples include the assessment and communication of natural capital value as well as the involvement and activation of business associations and companies for the preservation of biological diversity through dialogue and action formats.

### 3.8 Urban transformation and green infrastructure

More than half of the world's population now lives in cities and metropolises. In 2030, which represents a (provisional) goal for many strategies at the international level, it will even be 60 per cent (UN 2018). Urbanization is progressing globally and cities are also growing in Germany. They are places where not only many people come together, but also the great challenges of our time coincide: adaptation to climate change, maintaining and creating healthy living conditions, social justice, and the associated halting of the loss of urban biodiversity (Lindley et al. 2019). However, current management approaches to addressing these challenges no longer fit the complexity requirements of globalized cities (Elmqvist et al 2019).

A fundamental and long-term change is therefore needed through an approach which recognizes the interconnectedness and diversity of processes: the urban transformation (Difu et al. 2021). Through transformative change, cities should develop into healthy living spaces.

With regard to urban nature conservation, the concept of urban green infrastructure (UGI) is a key approach to urban transformation. Generally outlined as green infrastructure in the EU Biodiversity Strategy 2020 (KOM 2011), the BfN supports its specification in the national context: UGI is thus a “network of natural and designed areas and elements in cities that are planned and maintained in such a way that together they have high quality in terms of usability, biological diversity, and aesthetics and provide a wide range of ecosystem services” (Hansen et al. 2017).



Figure 8: Urban transformation is achieved primarily through direct encounters, as in urban gardening.  
(Photo: Dominik Wolf)

The concept's transformative character comes primarily from the fact that UGI planning and development is designed to be strategic and participatory and involves various actors. In the interests of socially, economically, and ecologically sustainable urban development, the challenges mentioned can be addressed with the help of a biodiversity-focused UGI.

Thinking and acting in accordance with UGI can support authorities and other actors in finding a holistic approach and avoiding path dependencies. It helps to find a common language between different specialist planning and a key to action through a common concept. Therefore, action should be less divided into sectors and responsibilities and one should not lose sight of the goal: a species-rich urban environment that, like an infrastructure in the city, also provides services with regard to climate adaptation and health. One is thereby not just limited to area-based measures: for example, when buildings are required to be energy-efficient, an important contribution to species conservation can be made by incorporating biodiversity aspects (e.g. through “animal-aided design”). Opportunities to experience nature close to a residential area can make an important contribution to both human health and social cohesion (Berger and Eser 2021).

A real transformative change can therefore take place, with urban nature and its services taking on an essential role in public welfare. In this way, it can find its way into administrative units beyond green space authorities and nature conservation authorities and help to create the basis for a healthy life through more biodiversity in cities.

However, this also requires guidance and strategic direction on the part of the municipalities. Indicators and corresponding guide values for urban green areas are a great support as they point the way towards a target system.

The BfN presents orientation values for public green spaces and recreational facilities, which take into account the above-mentioned challenges as well as other challenges facing cities, such as sustained growth and associated internal structural development.

To this end, existing orientation values were further developed with regard to the functions of recreation, health, climate, and biodiversity. Moreover, indicator sets were created, which are to be implemented in a nationwide convention. Through a new conceptual approach and guidance for a target system, nature conservation in the city can make a decisive contribution to transformative change (see Blum et al. 2023).

#### **Box 4: Urban Gardening**

Urban gardening is a good example of an element of green infrastructure in urban areas to describe transformative change: with the participation of a wide range of population groups, but also through alliances and synergies with other actors (e.g., local authorities), urban gardens are created on public or private areas that strengthen the neighbourhood and the sense of togetherness. They also serve as a place where residents and those responsible (e.g., from administrative bodies) make new contacts in negotiation processes. Through urban gardening, people can experience biodiversity and, especially children in cities, make contact with nature (van der Jagt et al. 2019).

## 4 Conclusions

The BfN supports a fundamental change in our social relationship to nature, a social-ecological transformation that envisages a restructuring of legal framework conditions, but also a change in individual lifestyles, within a safe operating space within the planetary boundaries. There is extraordinarily high urgency to act. This is not about a single major upheaval, but rather about a consistent, step-wise and diverse change towards sustainability. The main causes of the increasing loss of biodiversity are the scope and intensity of certain land uses as well as underlying and often taken-for-granted consumer demands and associated production patterns. Transformative change can therefore only succeed with “less” consumption of land, energy, and goods<sup>3</sup>.

Transformative change also means that not all consumption opportunities are taken advantage of. **Sufficiency**<sup>4</sup> asks questions about what is “enough” and avoids the supposedly unlimited consumption practices that are harmful to nature. However, “doing without” does not just mean constraints and loss of cherished habits, but rather gaining other freedoms that we are already foregoing or will have to forego in the future if we continue with business-as-usual; these include the experience of species-rich and resilient nature, cities worth living in, and healthy food (Heiland and Hachtmann 2022). It also safeguards future opportunities for future generations.

The federal government's **new version of the NBS 2030**, which is currently being developed, must be used to initiate a transformative change in order to address the underlying causes of biodiversity decline. In the coming years, the following will apply more than ever: effective solutions are only possible if **synergy effects** are used or **co-benefit strategies** are pursued – as is achieved with nature-based solutions for climate and biodiversity. However, there will also be conflicting goals, such as in the expansion of renewable energies or in the entire discussion about accelerating planning for infrastructure measures. These conflicts cannot be ignored, nor can the associated **questions of justice**. A democratic and equitable social approach to different interests, tensions, disputes, and opposition is an essential part of transformative change.

The overarching goal of a social-ecological transformation, or transformative change, includes three dimensions for the work of the BfN:

- **Transformation OF nature conservation**

It is important to also reflect on the role of nature conservation in its contribution to transformative change. This requires concepts that make the best possible use of synergy potential and manage conflicts of interest through acceptable and sustainable compromises, without one-sided prioritization of, for example, climate change mitigation.

Transformative change OF nature conservation can be found, for example, in concepts such as nature-based solutions for climate and biodiversity (example of win-win) or the 'National Species Aid Programme' (example of compromise).

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<sup>3</sup> This argument applies primarily to the rich societies of the Global North.

<sup>4</sup> Sufficiency is to be understood in the sense of the lowest possible, self-limiting consumption of raw materials and energy.



- **Transformation THROUGH nature conservation**

Nature conservation, with its diversity of measures, is part of development within planetary boundaries and also provides important impetus for successful implementation of social-ecological transformation in fields of action beyond (classic) nature conservation. Transformative change without nature conservation cannot be achieved.

Numerous examples of such contributions are described in the transformation areas mentioned above. The concept of urban green infrastructure (UGI) is worth emphasizing as a key approach to urban transformative change, as well as the communication of the effects of individual consumption decisions on biodiversity, whereby other values beyond purely economic factors influence individual purchasing decisions (BfN 2020). It is important to further strengthen such successful approaches through nature conservation policy, for example within the framework of the NBS 2030, and to expand them for the broadest possible application.

- **Transformation FOR nature conservation**

In a transformative change FOR nature conservation, it is necessary to address the drivers of biodiversity loss in a wide variety of sectors/areas. At the same time, there is an opportunity to productively shape social change towards a nature-friendly way of life.

This means that nature conservation must be one of the priority goals of sustainable transformative change (see ENCA 2022) and does not just exist as a sideshow. This requires cross-departmental solutions in the sense of policy integration, in which the drivers of biodiversity loss are directly addressed, such as the restructuring of today's food systems and a change away from animal-based diets (see also IPBES 2019, WGBU 2020) or ecosystem accounting in which the value of nature can be recognized and consistently taken into account in all sectors of action and politics. At the same time, transformative change FOR nature conservation also means ensuring broad social support for such a change and supporting corresponding changes in behaviour. Nature conservation must help shape such a social transformation and convey emotionally appealing, nature-friendly visions of the future.

From the BfN's point of view, a transformative change OF, THROUGH, and FOR nature conservation provides an opportunity to overcome the crises of our time and to preserve our natural life support system. The aim of this transformative change is a future worth living.

It should be a future in which humanity has curbed climate change and its consequences and has halted the loss of biological diversity. In which people benefit also in the long term from fresh water, clean air, a healthy diet and fertile soils, without crossing planetary boundaries. In which everyone enjoys fair access to nature and its diverse services and preserves them for future generations. In which people feel like they are part of nature and, both collectively and individually, can always continue to enjoy it.

In the BfN's opinion, it is worth daring to make that change.

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## References

- Bamberg, S., Mues, A. W., Reese, G., Kösling, P., van Deuren, C. and Tröger, C. (2023 a): Development of a measuring instrument to monitor the biodiversity awareness of the German population. *Journal of Environmental Psychology*, Volume 91 (102122). Available online at: <https://doi.org/10.1016/j.jenvp.2023.102122>
- Berger, L. (2019): Neue Gentechniken und Naturschutz - ein dynamisches Verhältnis. In: Christiane Schell, Margret Engelhard, Hans-Werner Frohn and Lars Berger (Eds): *Neue Gentechniken und Naturschutz. Eine Verhältnisbestimmung*. Bonn: BfN Bundesamt für Naturschutz (BfN-Skripten, 546), pp. 111-119. Available online at: <https://doi.org/10.19217/skr546>
- Berger, L. and U. Eser (2021): *Naturschutz und Soziale Fragen: Theoretische Grundlagen*. In: Berger, L. (Ed.): *Das Soziale im Naturschutz. Theorie – Praxis – Handlungserfordernisse*. Bonn: Bundesamt für Naturschutz (BfN-Skripten, 605), pp. 7-21. Available online at: <https://doi.org/10.19217/skr605>
- Berger, L. and C. Schell (2022): Keine Krise steht allein. In: Lars Berger, Hans-Werner Frohn and Christiane Schell (Eds.): *Biodiversitätsverlust, Klimawandel und Covid-19-Pandemie. Zum Verhältnis bestehender Krisenlagen*. Bonn: BfN Bundesamt für Naturschutz (BfN-Skripten, 641), pp. 125-129. Available online at: <https://doi.org/10.19217/skr641>
- BfN – Bundesamt für Naturschutz (2018): *Rote Liste gefährdeter Tiere, Pflanzen und Pilze Deutschlands. Band 7: Pflanzen. Naturschutz und Biologische Vielfalt 70(7)*. Münster: BfN-Schriftenvertrieb im Landwirtschaftsverlag.
- BfN – Bundesamt für Naturschutz (2020): *Konsum-Wende für den Erhalt von biologischer Vielfalt und Ökosystemleistungen weltweit*. Available online at <https://www.bfn.de/publikationen/broschuere/konsum-wende-fuer-den-erhalt-von-biologischer-vielfalt-und> (Accessed 10.07.2023).
- BfN – Bundesamt für Naturschutz (2022a): *Eckpunkte für einen vorsorgenden Schutz vor Hochwasser und Sturzfluten*. Available online at <https://www.bfn.de/publikationen/positionspapier/eckpunkte-fuer-einen-vorsorgenden-schutz-vor-hochwasser-und-sturzfluten> (Accessed 07.09.2023)
- BfN – Bundesamt für Naturschutz (2022b): *Eckpunkte für einen naturverträglichen Ausbau der Solarenergie*. Available online at <https://www.bfn.de/publikationen/positionspapier/eckpunkte-fuer-einen-naturvertraeglichen-ausbau-der-solarenergie> (Accessed 10.07.2023).
- BfN – Bundesamt für Naturschutz (2022c): *Einzigartige Natur der Bienwaldregion langfristig gesichert*. Available online at <https://www.bfn.de/aktuelles/einzigartige-natur-der-bienwaldregion-langfristig-gesichert> (Accessed 04.07.2023).
- BfN – Bundesamt für Naturschutz (2022d): *Gentechnik, Naturschutz und biologische Vielfalt: Grenzen der Gestaltung*. Positionspapier. BfN. Bonn: 33 pp. DOI: 10.19217/pos222. Available in German at <https://bit.ly/gentech-natsch>, in English at <https://bit.ly/gen-engin-conserv>.
- BfN – Bundesamt für Naturschutz (2023): *Neue Sicht auf die Werte der Natur*. Available online at <https://www.bfn.de/publikationen/policy-brief/neue-sicht-auf-die-werte-der-natur> (Accessed 10.07.2023).
- Blum, P., Böhme, C., Kühnau, C., Reinke, M., Willen, L. (Eds.) (2023): *Stadtnatur erfassen, schützen, entwickeln: Orientierungswerte und Kenngrößen für das öffentliche Grün. Deutschland*. Bonn: BfN Bundesamt für Naturschutz (BfN-Skripten, 653). Available online at: <https://doi.org/10.19217/skr653>
- BMUV - Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz (2022): *Umweltbewusstsein in Deutschland 2020. Ergebnisse einer repräsentativen Bevölkerungsumfrage*. Available online at [https://www.bmu.de/fileadmin/Daten\\_BMU/Pool/Broschueren/umweltbewusstsein\\_2020\\_bf.pdf](https://www.bmu.de/fileadmin/Daten_BMU/Pool/Broschueren/umweltbewusstsein_2020_bf.pdf) (Accessed 13.04.2023).

- BMUV & BfN - Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz & Bundesamt für Naturschutz (2023): Naturbewusstsein 2021. Bevölkerungsumfrage zu Natur und biologischer Vielfalt. Available online at [https://www.bmuv.de/fileadmin/Daten\\_BMU/Pool/Broschueren/naturbewusstsein\\_2021\\_bf.pdf](https://www.bmuv.de/fileadmin/Daten_BMU/Pool/Broschueren/naturbewusstsein_2021_bf.pdf) (Accessed 29.06.2023).
- Brand, U., Wissen, M. (2018): The limits to capitalist nature. Theorizing and overcoming the imperial mode of living. London: Rowman & Littlefield International (Transforming capitalism).
- Bulkeley, H., Kok, M., Dijk, J., Forsyth, T., Nagy, G., Villasante, S. (2020): Moving Towards Transformative Change for Biodiversity: Harnessing the Potential of the Post-2020 Global Biodiversity Framework.
- Bundesregierung (2007): Nationale Strategie zur biologischen Vielfalt. Available online at <https://www.bmuv.de/themen/naturschutz-artenvielfalt/naturschutz-biologische-vielfalt/allgemeines/-strategien/nationale-strategie-zur-biologischen-vielfalt> (Accessed 13.04.2023).
- Bundesregierung (2021): Mehr Fortschritt wagen. Bündnis für Freiheit, Gerechtigkeit und Nachhaltigkeit. Available online at <https://www.bundesregierung.de/breg-de/aktuelles/koalitionsvertrag-2021-1990800> (Accessed 24.04.2023).
- BÜNDNIS 90/ DIE GRÜNEN (2023): Beschlusspapier Koalitionsausschuss 28. März 2023: Modernisierungspaket für Klimaschutz und Planungsbeschleunigung. Available online at <https://cms.gruene.de/uploads/images/Ergebnis-Koalitionsausschuss-28.-M%C3%A4rz-2023.pdf> (Accessed 24.04.2023).
- CBD - Convention on Biological Diversity (2022): Kunming-Montreal Global biodiversity framework. Available online at <https://www.cbd.int/doc/c/e6d3/cd1d/daf663719a03902a9b116c34/cop-15-l-25-en.pdf> (Accessed 12.04.2023).
- Cordain, L., Eaton, S. B., Sebastian, A., Mann, N., Lindeberg, S., Watkins, B. A., O 'Keefe, J. H. & Brand-Miller, J. (2005): Origins and evolution of the Western diet: health implications for the 21st century, The American journal of clinical nutrition, Vol. 81, No. 2, pp. 341–354. Available online at: <https://doi.org/10.1093/ajcn.81.2.341>
- Dasgupta, P. (Ed.) (2021): The economics of biodiversity: the Dasgupta review. Full report. Great Britain. Updated: 18 February 2021. London: HM Treasury.
- Davis, M., Schneider, C., Mrogenda, K., (2023): Digitalisierung im Naturschutz – eine Zusammenfassung von Potentialen, Risiken und ausgewählten Schwerpunkten. In: Natur und Landschaft 2023(6/7): pp. 336-346.
- Difu - Deutsches Institut für Urbanistik (2021): Wie leben wir morgen? Forschungsimpulse für eine nachhaltige Stadt. Abschlusspublikation des SynVer\*Z-Projekts. Berlin.
- Elmqvist, T. (2019): Sustainability and resilience for transformation in the urban century. Nature Sustainability 2, pp. 267–273.
- EU Commission (2011): Our life insurance, our natural capital: an EU biodiversity strategy to 2020 Brussels. Available online at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52011DC0244> (Accessed 11.09.2023).
- EU Commission (2020a): EU Biodiversity Strategy for 2030, EU Commission COM (2020) 380 final. Available at [https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030\\_de](https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_de) (Accessed 29.06.2023).
- EU Commission (2020b): A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system EU Commission COM (2020) 381 final. Available online at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0381> (Accessed 12.04.2023).

- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy Available online at <https://eur-lex.europa.eu/eli/dir/2000/60/oj?locale=en#> (Accessed 13.04.2023).
- Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive). Available online at <https://eur-lex.europa.eu/eli/dir/2008/56/oj> (Accessed 13.04.2023).
- EU Regulation No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC Available online at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32013R1380&qid=1710616214718> (Accessed 13.04.2023).
- FAO - Food and Agriculture Organization of the United Nations (2022): Repurposing food and agricultural policies to make healthy diets more affordable. Rome: FAO. Available online at: <https://doi.org/10.4060/cc4348en>
- FDP (2023): Beschlusspapier Koalitionsausschuss 28 March 2023: Modernisierungspaket für Klimaschutz und Planungsbeschleunigung. Available online at <https://www.fdp.de/media/4954/download?attachment> (Accessed 24.04.2023).
- Finck, P., Heinze, S., Rath, U., Riecken, U., & Ssymank, A. (2017). Rote Liste der gefährdeten Biotoypen Deutschlands. Bundesamt für Naturschutz.
- Footprint Data Foundation, York University Ecological Footprint Initiative & Global Footprint Network (2022): National Footprint and Biocapacity Accounts, 2022 edition. Available online at: <https://data.footprintnetwork.org> (Accessed 10.07.2023).
- Frohn, H. W., Wichert, F. (Eds.) (2018): Naturschutz: natürlich sozial, interkulturell und inkludierend?! Ergebnisse der Tagungen "Naturschutz - natürlich sozial!" (24-25 November 2015), "Naturschutz - natürlich interkulturell?!" (22-23 November 2016) und "Naturschutz - natürlich inklusiv!" (11-12 October 2017) im Bundesamt für Naturschutz, Bonn. Bonn: BfN Bundesamt für Naturschutz (BfN-Skripten, 514). Available online at <https://www.bfn.de/publikationen/bfn-schriften/bfn-schriften-514-naturschutz-natuerlich-sozial-interkulturell-und> (Accessed 12.04.2023). Available online at: <https://doi.org/10.19217/skr514>
- Frohn, H. W., Birkenstein, G., Brennecke, J., Solveig; Diemer, S., Koch, E., Ziemek, H. P., Blöbaum, A. (2020): Perspektivwechsel. Naturpraktiken und Naturbedürfnisse sozialökonomisch benachteiligter Menschen; eine qualitative Pionierstudie: Abschlussbericht zum F+E-Vorhaben "Perspektivwechsel: die Bedeutung der biologischen Vielfalt für urbane, sozialökonomisch benachteiligte Milieus und deren Lebensqualität - historische Analyse, Zustandsbeschreibung und Empfehlung für zukünftige naturschutzpolitische Ansätze" (FKZ: 3516 81 0300). With the collaboration of Hildegard Sicker. Bonn: BfN Bundesamt für Naturschutz (BfN-Skripten, 559). Available online at: <https://www.bfn.de/publikationen/bfn-schriften/bfn-schriften-559-perspektivwechsel-naturpraktiken-und>
- Gebhard, U. (2016): Landschaft, Identität und Gesundheit. Zum Konzept der Therapeutischen Landschaften. Wiesbaden: Springer Fachmedien Wiesbaden GmbH. Available online at <https://livivo.idm.oclc.org/login?url=https://ebookcentral.proquest.com/lib/zbmed-ebooks/detail.action?docID=4516715> (Accessed 12.04.2023). Available online at: <https://doi.org/10.1007/978-3-531-19723-4>
- Göpel, Maja; Leitschuh, Heike; Brunnengräber, Achim; Ibisch, Pierre; Loske, Reinhard; Müller, Michael et al. (Eds.) (2019): Die Ökologie der digitalen Gesellschaft: S. Hirzel Verlag (Jahrbuch Ökologie).
- Hansen, R., Born, D., Lindschulte, K., Rolf, W., Bartz, R., Schröder, A., Becker, C. W., Kowarik, I., Pauleit, S., (2017): Grüne Infrastruktur im urbanen Raum: Grundlagen, Planung und Umsetzung in der

- integrierten Stadtentwicklung. Bonn: BfN Bundesamt für Naturschutz (BfN-Skripten, 503). Available online at <https://www.bfn.de/sites/default/files/BfN/service/Dokumente/skripten/skript503.pdf> (Accessed 13.04.2023). Available online at: <https://doi.org/10.19217/skr503>
- Heiland, S., Hachtmann, M. (2022): Tabu Suffizienz: Warum Technik, Schutzgebiete und Planung allein die biologische Vielfalt nicht retten werden. Ed. v. netzwerk-forum zur Biodiversitätsforschung Deutschland (Vielfalt im Dialog - Wie weiter mit den Zielen zum Schutz der biologischen Vielfalt?). Available online at <https://www.ufz.de/nefo/index.php?de=49736&nopagecache> (Accessed 12.04.2023).
- Heißenhuber, A., Haber, W., Krämer, C. (2015): Umweltprobleme der Landwirtschaft - eine Bilanz: 30 Jahre SRU-Sondergutachten. Available online at [https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/texte\\_28\\_2015\\_umweltprobleme\\_der\\_landwirtschaft.pdf](https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/texte_28_2015_umweltprobleme_der_landwirtschaft.pdf) (Accessed 13.04.2023).
- ICES - International Council for the Exploration of the Sea (2022a): Cod (*Gadus morhua*) in subdivisions 22–24, western Baltic stock (western Baltic Sea). ICES Advice: Recurrent Advice. Report. Available online at <https://doi.org/10.17895/ices.advice.19447868.v1> (Accessed 12.04.2023).
- ICES - International Council for the Exploration of the Sea (2022b): Cod (*Gadus morhua*) in subdivisions 24–32, eastern Baltic stock (eastern Baltic Sea). ICES Advice: Recurrent Advice. Report. Available online at <https://doi.org/10.17895/ices.advice.19447874.v1> (Accessed 12.04.2023).
- ICES - International Council for the Exploration of the Sea (2022c): Herring (*Clupea harengus*) in subdivisions 20–24, spring spawners (Skagerrak, Kattegat, and western Baltic). ICES Advice: Recurrent Advice. Report. Available online at <https://doi.org/10.17895/ices.advice.19447964.v1> (Accessed 12.04.2023).
- IPBES - Intergovernmental Platform on Biodiversity and Ecosystem Services (2019): Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Bonn: IPBES Secretariat. Available online at: <https://doi.org/10.5281/zenodo.6417333>
- IPBES - Intergovernmental Platform on Biodiversity and Ecosystem Services (2019): Summary for policymakers of the global assessment report on biodiversity and ecosystem services. Available online at [https://www.ipbes.net/sites/default/files/inline/files/ipbes\\_global\\_assessment\\_report\\_summary\\_for\\_policymakers.pdf](https://www.ipbes.net/sites/default/files/inline/files/ipbes_global_assessment_report_summary_for_policymakers.pdf) (Accessed 13.04.2023). <https://doi.org/10.5281/zenodo.3553579>
- IPBES - Intergovernmental Platform on Biodiversity and Ecosystem Services (2021): Scientific outcome of the IPBES-IPCC co-sponsored workshop on biodiversity and climate change; Bonn: IPBES secretariat. Available online at: <https://doi.org/10.5281/zenodo.5101125>
- IPCC - 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. Available online at <https://www.ipcc.ch/site/assets/uploads/2019/11/SRCCL-Full-Report-Compiled-191128.pdf> (Accessed 29.06.2023).
- IPCC – Intergovernmental Panel on Climate Change (2022): Summary for Policymakers [P.R. Shukla, J. Skea, A. Reisinger, R. Slade, R. Fradera, M. Pathak, A. Al Khourdajie, M. Belkacemi, R. van Diemen, A. Hasija, G. Lisboa, S. Luz, J. Malley, D. McCollum, S. Some, P. Vyas, (eds.)]. In: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA. doi: 10.1017/9781009157926.001.
- Jankowski, P., Höfner, A., Hoffmann, M. L., Rohde, F., Rehak, R., Graf, J. (Eds.) (2023): Shaping digital transformation for a sustainable society. Contributions from Bits & Bäume. Technische Universität

- Berlin: Technische Universität Berlin. Available online at <https://publication2023.bits-und-baeume.org/> (Accessed 03.08.2023). <https://doi.org/10.14279/depositonce-17526>
- Kliem, L., Pentzien, J., Baldauf, M., Bidjanbeg, A., Fehrenbach, H., Auberger, A., Köppen, S. (2019): Sustainable Consumption for Biodiversity and Ecosystem Services: The cases of cotton, soy and lithium. BfN, Bonn.
- Lindley, S. J., Cook, P. A., Dennis, M., Gilchrist, A. (2019): Biodiversity, Physical Health and Climate Change: A Synthesis of Recent Evidence. In: Marselle, M. et al. (eds) Biodiversity and Health in the Face of Climate Change, pp. 17-46. Available online at: [https://doi.org/10.1007/978-3-030-02318-8\\_2](https://doi.org/10.1007/978-3-030-02318-8_2)
- Nationale Akademie der Wissenschaften Leopoldina (2020): Globale Biodiversität in der Krise - Was können Deutschland und die EU dagegen tun? Halle (Saale): Deutsche Akademie der Naturforscher Leopoldina e.V. - Nationale Akademie der Wissenschaften. Available online at [https://www.leopoldina.org/uploads/tx\\_leopublication/2020\\_Diskussionspapier\\_Biodiversitaetskrise\\_web.pdf](https://www.leopoldina.org/uploads/tx_leopublication/2020_Diskussionspapier_Biodiversitaetskrise_web.pdf) (Accessed 13.04.2023).
- Pörtner, H.O., Scholes, R.J., Agard, J., Archer, E., Arneeth, A., Bai, X., Barnes, D., Burrows, M., Chan, L., Cheung, W.L., Diamond, S., Donatti, C., Duarte, C., Eisenhauer, N., Foden, W., Gasalla, M. A., Handa, C., Hickler, T., Hoegh-Guldberg, O., Ichii, K., Jacob, U., Insarov, G., Kiessling, W., Leadley, P., Lee-mans, R., Levin, L., Lim, M., Maharaj, S., Managi, S., Marquet, P. A., McElwee, P., Midgley, G., Oberdorff, T., Obura, D., Osman, E., Pandit, R., Pascual, U., Pires, A. P. F., Popp, A., Reyes-García, V., Sankaran, M., Settele, J., Shin, Y. J., Sintayehu, D. W., Smith, P., Steiner, N., Strassburg, B., Sukumar, R., Trisos, C., Val, A.L., Wu, J., Aldrian, E., Parmesan, C., Pichs-Madruga, R., Roberts, D.C., Rogers, A.D., Díaz, S., Fischer, M., Hashimoto, S., Lavorel, S., Wu, N., Ngo, H.T. (2021): IPBES-IPCC co-sponsored workshop report on biodiversity and climate change Available online at <https://doi.org/10.5281/zenodo.4782538> (Accessed 10.0.2023).
- Reese, G., Römpke, A., Bernd, A., Dolderer C. and Mues A.W. (2023): The puzzle of transformation. Impulses from environmental psychological research. Bonn: BfN Bundesamt für Naturschutz (BfN Schriften 658). Available online at <https://www.bfn.de/publikationen/bfn-schriften/bfn-schriften-658-puzzle-transformation-impulses-environmental>
- Reckwitz, A., Rosa, H. (2021): Spätmoderne in der Krise. Was leistet die Gesellschaftstheorie? With the collaboration of Martin Bauer. First edition. Berlin: Suhrkamp. Available online at <https://www.perlentaucher.de/buch/andreas-reckwitz-hartmut-rosa/spaetmoderne-in-der-krise.html> (Accessed 12.04.2023).
- Reilly, J. R., Artz, D. R., Biddinger, D., Bobiwash, K., Boyle, N. K., Brittain, C., Brokaw, J., Campbell, J. W., Daniels, J., Elle, E., Ellis, J. D., Fleischer, S. J., Gibbs, J., Gillespie, R. L., Gundersen, K. B., Gut, L., Hoffman, G., Joshi, N., Lundin, O., Mason, K., McGrady, C. M., Peterson, S. S., Pitts-Singer, T. L., Rao, S., Rothwell, N., Rowe, L., Ward, K. L., Williams, N. M., Wilson, J. K., Isaacs, R. & Winfree, R. (2020): Crop production in the USA is frequently limited by a lack of pollinators, Proceedings of the Royal Society B: Biological Sciences, Vol. 287, Issue 1931. Available online at: <https://doi.org/10.1098/rspb.2020.0922>
- Rosinski, E., Bartel, A., Günther, A., Heinze, S., Hofer, B., Jurasinski, G., Söchting, H. P., Ullrich, K., Huth, V. (2021): Wiederherstellung von Hochmoorbiotopen nach intensiver Grünlandnutzung - drei Jahre Vegetationsentwicklung im Feldversuch OptiMoor. Natur und Landschaft: Zeitschrift für Naturschutz und Landschaftspflege 96 (4), pp. 192-201.
- Schell, C., Engelhard, M., Frohn, H. W., Berger, L. (Eds.) (2019): Neue Gentechniken und Naturschutz. Eine Verhältnisbestimmung. Deutschland. Bonn: BfN Bundesamt für Naturschutz (BfN-Skripten, 546). Available online at: <https://doi.org/10.19217/skr546>
- Scherber, C., Eisenhauer, N., Weisser, W. W., Schmid, B., Voigt, W., Fischer, M., Schulze, E. D., Roscher, C., Weigelt, A., Allan, E., Beßler, H., Bonkowski, M., Buchmann, N., Buscot, F., Clement, L. W.,

- Ebeling, A., Engels, C., Halle, S., Kertscher, I., Klein, A. M., Koller, R., König, S., Kowalski, E., Kummer, V., Tschardtke, T. (2010): Bottom-up effects of plant diversity on multitrophic interactions in a biodiversity experiment. *Nature* 468, pp. 553–556. Available online at: <https://doi.org/10.1038/nature09492>
- Schloßberger, M. (Ed.) (2015): Die Natur und das gute Leben. Dokumentation zur gleichnamigen Tagung im März 2014 an der Universität Potsdam. Bonn: BfN Bundesamt für Naturschutz (BfN-Skripten, 403). Available online at [https://www.bfn.de/fileadmin/BfN/gesellschaft/Dokumente/Skript\\_403\\_Das-gute-Leben\\_Barrierefrei\\_Internet\\_aktualisiert.pdf](https://www.bfn.de/fileadmin/BfN/gesellschaft/Dokumente/Skript_403_Das-gute-Leben_Barrierefrei_Internet_aktualisiert.pdf) (Accessed 12.04.2023).
- Schneider, C., Mrogenda, K., Dibbern, B., Höfer, R., Davis, M., Sommer, H., Bilo, M. (2021): Umweltinformationssysteme für den Naturschutz. Potenziale, Risiken, Anwendungsfelder und Entwicklungsperspektiven. In: Gesellschaft für Informatik e.V. (GI) (Ed.): INFORMATIK 2021. Computer Science & Sustainability. Bonn: pp. 623-632. Available online at: <https://doi.org/10.18420/informatik2021-051>
- Scotti, M., Opitz S., MacNeil L., Kreutle A., Pusch C., Froese R. (2022): Ecosystem-based fisheries management increases catch and carbon sequestration through recovery of exploited stocks: the western Baltic Sea case study. *Frontiers in Marine Science*. Available online at <https://www.frontiersin.org/articles/10.3389/fmars.2022.879998/full> (Accessed 13.04.2023). <https://doi.org/10.3389/fmars.2022.879998>
- Seebens-Hoyer, A., Bach, L., Bach, P., Pommeranz, H., Götsche, M., Voigt, C., Hill, R., Vardeh, S., Götsche, M., Hinrich, M., (2022): Fledermausmigration über der Nord- und Ostsee. Bonn: BfN Bundesamt für Naturschutz (BfN-Skripten, 631). Available online at <https://www.bfn.de/publikationen/bfn-schriften/bfn-schriften-631-fledermausmigration-ueber-der-nord-und-ostsee> (Accessed 10.07.2023). <https://doi.org/10.19217/skr631>
- SPD (2023): Beschlusspapier Koalitionsausschuss 28. März 2023: Modernisierungspaket für Klimaschutz und Planungsbeschleunigung. Available online at [https://www.spd.de/fileadmin/Dokumente/Beschluesse/20230328\\_Koalitionsausschuss.pdf](https://www.spd.de/fileadmin/Dokumente/Beschluesse/20230328_Koalitionsausschuss.pdf) (Accessed 24.04.2023).
- UBA – Umweltbundesamt (2023): Umweltbewusstsein in Deutschland 2022. Ergebnisse einer repräsentativen Bevölkerungsumfrage. UBA, Dessau. 88 Seiten. Available online at: <https://www.umweltbundesamt.de/publikationen/umweltbewusstsein-in-deutschland-2022> (Accessed 19.09.2023)
- UN - United Nations (2015): Transformation unserer Welt: die Agenda 2030 für nachhaltige Entwicklung. New York: United Nations.
- UN - United Nations (2018): United Nations Department of Economic and Social Affairs, 2018: World Urbanization Prospects: The 2018 Revision. New York: United Nations. Available online at: <https://doi.org/10.18356/b9e995fe-en>
- Van der Jagt, A. P. N., Smith, M., Ambrose-Oji, B., Konijnendijk, C. C., Giannico, V., Haase, D., Laforteza, R., Nastran, M., Pintar, M., Železnikar, Š., Cvejić, R. (2019): Co-creating urban green infrastructure connecting people and nature: A guiding framework and approach. *Journal of Environmental Management* 233, pp. 757-767. Available online at: <https://doi.org/10.1016/j.jenvman.2018.09.083>
- WBGU - Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen (2011): Welt im Wandel. Gesellschaftsvertrag für eine Große Transformation. Berlin: WBGU.
- WBGU - Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen (2019): Unsere Gemeinsame digitale Zukunft. Zusammenfassung. Berlin: WBGU.
- WBGU - Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen (2020): Landwende im Anthropozän: Von der Konkurrenz zur Integration. Hauptgutachten. Berlin: WBGU.



- Wittmer, H. Berghöfer, A., Büttner L., Chakrabarty, R., Förster, J., Khan, S., König, C., Krause, G., Kreuer, D., Locher-Krause, K., Moreno Soares, T., Muñoz Escobar, M., Neumann, M., Renner, I., Rode, J., Schniewind, I., Schwarzer, D., Tröger, U., Zinngrebe, Y., Spiering, S. (2021): Transformative change for a sustainable management of global commons - biodiversity, forests and the ocean. Recommendations for international cooperation based on a review of global assessment reports and project experience. Available online at: <https://doi.org/10.57699/7s83-7z35>
- Wolff, F., Heyen, D. A., Brohmann, B., Griebhammer, R., Jacob, K. and L. Graaf (2018): Transformative Umweltpolitik: Nachhaltige Entwicklung konsequent fördern und gestalten. Ein Wegweiser für den Geschäftsbereich des BMU. Umweltbundesamt. Dessau-Roßlau.
- Wulfert, K., Köstermeyer, H., Lau, M. (2022): Vögel und Windenergienutzung. Bonn: BfN Bundesamt für Naturschutz (BfN-Skripten, 634). Available online at <https://www.bfn.de/publikationen/bfn-schriften/bfn-schriften-634-voegel-und-windenergienutzung> (Accessed 10.07.2023). <https://doi.org/10.19217/skr634>

Securing a future worth living requires a transformative change – a fundamental change in relationships with nature, of which we are a part, but also in relationships between humans.

This BfN position paper explains the role of nature conservation in achieving the overarching goal of such a social-ecological transformation, by exploring the three dimensions of transformative change OF, THROUGH and FOR nature conservation.

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