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Federal Action Plan

on Nature-based Solutions for Climate and Biodiversity

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Edited by
BMUV, Division N III 2 (Climate Policy in the Land Sector)

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Nature-based climate action[1] – preserving ecosystems and tackling the climate crisis

In the 2030 Agenda for Sustainable Development, the United Nations calls for the transformation of our world. In the 17 Sustainable Development Goals (SDGs), it sets out the areas and processes where transformation must take place. This transformation is also necessary to combat the existential crises that threaten our natural foundations of life: biodiversity loss, the climate crisis and pollution.

Over the past decades, our planet's biodiversity has declined massively and it is further jeopardised by the increasing input of harmful substances into the environment. At the same time, the average global temperature has already risen by more than 1.1 degrees Celsius from pre-industrial levels, with devastating consequences for nature and people. These crises are the direct result of human activities such as burning fossil fuels and the consumption of natural resources. As the landscape changes due to our intensive economic activities, habitats are becoming more susceptible to the impacts of the climate crisis, while biodiversity loss is increasing in practically every ecosystem. Enormous efforts are needed to stop biodiversity loss and limit global warming to 1.5 degrees Celsius.

Biodiversity loss and the climate crisis are closely linked: global warming is changing living conditions so fast that ecosystems cannot keep up and are becoming more and more fragile. Often, plant and animal species cannot adapt to these changed conditions but, due to habitat fragmentation, cannot avoid them either. In many places, fauna and flora are dying out. When ecosystems degrade, however, they release carbon sequestered in them for thousands of years at an extremely rapid rate – making the climate crisis self-perpetuating.

To tackle this dual crisis, biodiversity conservation and climate action must be more closely aligned, unresolved research questions answered and knowledge gaps closed. This will create synergies that can be leveraged. Central pillars are the preservation, renaturation and restoration of ecosystems. Natural and near-natural habitats will be preserved and new habitats created on managed areas by transitioning to sustainable and near-natural forms of use. These areas will provide habitats for an abundant and diverse range of flora and fauna. At the same time, such ecosystems are natural carbon sinks and reservoirs, as they can sequester carbon dioxide from the atmosphere and store carbon over the long term. Therefore, these ecosystems hold key potential for carbon dioxide removal (CDR), which is of growing importance for the goal of greenhouse gas neutrality and achieving net negative emissions. In residential areas, green spaces, building practices that minimise land use and a reduction in land sealing can significantly contribute to preserving the ecological functions of the soil and vegetation and sequestering carbon. Moreover, it has been shown that near-natural, diverse ecosystems are generally better equipped to cope with changes arising from the climate crisis: they are more resilient. For example, near-natural, diverse ecosystems can generate synergies with climate adaptation measures, because their greater capacity for water storage can cushion the effects of extreme weather events, especially heavy rainfall and drought.

The Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) emphasises the urgent need for immediate action, as we are on the verge of reaching critical global climate tipping points. Beyond these tipping points, impacts become unstoppable and ecosystems are irretrievably lost. We must change course as quickly as possible. We have to transition to a sustainable way of life – one that as far as possible preserves near-natural, biodiversity-rich ecosystems as an indispensable foundation of life and that contributes to meeting the 1.5 degrees Celsius limit. Nature-based climate action plays a key role in these efforts, also for the necessary net negative emissions.

1 Throughout this document, the German term "Natürlicher Klimaschutz" will be translated as either "nature-based climate action" or "Nature-based Solutions [for climate and biodiversity]", according to the respective context. Thereby, "nature-based climate action" refers to the policy level while "Nature-based Solutions [for climate and biodiversity]" refers to the actual measures taken. Thus, nature-based climate action is the policy of implementing Nature-based Solutions for climate and biodiversity.

What is nature-based climate action?

Nature-based climate action aims to preserve and preferably strengthen the climate mitigation effect of terrestrial or marine ecosystems, in line with the conservation of biodiversity. It uses Nature-based Solutions (NbS) to support both biodiversity conservation and climate action. Thus, nature-based climate action begins where biodiversity conservation and climate action intersect. Nature-based climate action does not look at individual measures in isolation, but deliberately uses synergies between climate action and biodiversity conservation to generate win-win outcomes. For this, it employs NbS in both natural environments and settlement areas.

NbS directly protect, strengthen and restore ecosystems. It is important here to consider the varied and complex connections in ecosystems as a whole. Measures that have a direct impact on net greenhouse gas emissions are just one of several components. It is equally important to strengthen the resilience of ecosystems to the impacts of the climate crisis. For that reason, nature-based climate action also establishes the conditions needed for such measures, through actions ranging from assessing ecosystem status and determining the causes of potential or already occurring degradation to developing suitable measures.

NbS often also help adapt to the impacts of the climate crisis. A near-natural water balance that keeps water in the landscape, for example, is needed to rewet peatlands and other wetlands. At the same time, these solutions prevent droughts and create retention areas to protect against local flooding after heavy rainfall events, which are expected to occur with greater intensity and frequency in future.

Goals of the Action Plan

With the Federal Action Plan on Nature-based Solutions for Climate and Biodiversity, the German government aims to make a key contribution to significantly improving the general condition of ecosystems in Germany, thus strengthening their resilience and climate mitigation performance. The services they perform include reduction, adaptation and negative emissions. Terrestrial and marine environments will be better protected and become more resilient, enabling them to contribute to the national climate targets for the long term. Agriculture and forestry will become sustainable and allow more space for a diverse range of flora and fauna on the managed areas. It is important to closely coordinate Nature-based Solutions and the necessary expansion of renewable energies and to exploit potential synergies.

We will involve local communities as partners and participants, because people who own or manage land and those responsible in municipalities and cities can help tailor measures as precisely as possible. The measures set out in the Action Plan focus particularly on support, in order to create financial incentives for voluntary implementation of NbS. Measures will be flanked by a review of the legal framework – also aimed at facilitating implementation of supported projects – consultation and education services, modern research and innovation projects and comprehensive monitoring. The Action Plan takes account of interactions with existing EU regulations and directives and EU legislation currently in coordination.

Healthy and stable ecosystems are resilient and therefore able to make a long-term contribution to climate change mitigation. In 2021, the amendment to the Federal Climate Change Act laid down the first specific targets for terrestrial ecosystems, which are captured in the total net emissions of the land use, land use change and forestry (LULUCF) sector. The target for average net emissions in this sector for the period 2027 to 2030 is minus 25 million tonnes of CO_2 equivalents per year. This means that every year, the LULUCF sector must remove and permanently store 25 million tonnes more CO_2 equivalents than it emits, for example from drained peatlands. The targeted net emissions for the period 2037 to 2040 is minus 35 million tonnes of CO_2 equivalents and the annual goal for the period 2042 to 2045 is minus 40 million tonnes of CO_2 equivalents. A comparable target for 2030 is also laid down for the sector at EU level. These goals set the bar very high, making it all the more important to have functioning, customised tools to achieve them.

The Federal Action Plan on Nature-based Solutions for Climate and Biodiversity is the German government's primary instrument for reaching these targets. To this end, the emissions of the LULUCF sector have to be reduced as quickly as possible and existing sinks that remove greenhouse gases from the atmosphere must be stabilised and expanded. These actions must be considered and developed alongside relevant measures implemented at EU level. The measures under the Action Plan are designed with a view to achieving,

based on the data of the 2022 greenhouse gas inventory, the goals set out in section 3a of the Federal Climate Change Act. Concrete targets and indicators for measuring target achievement will be developed and specified when the funding guidelines for each of the Action Plan measures are drawn up. For all measures, regardless of type (funding programme, regulatory law, planning law, supporting measures etc.), a presentation of the success, effect and interactions of the measures in terms of greenhouse gas emission savings, biodiversity, water and other goals and priorities of the Action Plan must be ensured across all ministries. Where necessary measures will be adjusted and new priorities set, in line with the results of the regular progress assessment and to reflect new scientific findings.

The measures support target achievement in two different ways: many measures raise the resilience of ecosystems and advance their restoration. The aim is to reverse the ongoing deterioration of the sector's net greenhouse gas emissions and bring them back to a level of around minus 17 million tonnes CO_2 equivalents annually. This corresponds to the starting level assumed at the planning stage of the Federal Climate Change Act. In addition, measures will be implemented that are specifically designed to enhance the climate mitigation effect of ecosystem management for the long term. These measures are aimed at improving the climate footprint of the LULUCF sector by 2030 by an additional eight million tonnes of CO_2 equivalents. The measures are subject to regular progress assessment and, where necessary, updated to reflect new scientific findings.

A particular focus is on drained peatlands as a major source of greenhouse gases and on forests as sinks for greenhouse gases. Drained peatlands are the largest source of greenhouse gas emissions in the LULUCF sector and need to be rewetted at a much faster pace. The National Peatland Protection Strategy calls for annual emissions in this sector to be reduced by five million tonnes of CO_2 equivalents by the year 2030. Forests, on the other hand, are the largest land-based greenhouse gas sinks in Germany and can remove carbon from the atmosphere permanently. However, the function of these sinks is at risk because of the increasing frequency of droughts and consequent disasters resulting from the climate crisis, and because of forest loss caused by more frequent extreme weather events like storms or by secondary pests. With this in mind, existing forests are to be restructured to become species-rich, resilient and hence more stable ecosystems, and 10,000 hectares of new forest will be created every year between 2023 and 2030.

Experience has shown that the more natural and diverse ecosystems are, the greater their resilience. In other words, the better they are able to cope with the destabilising outside influences that continue to increase with the climate and biodiversity crises. Besides their primary goal of expanding climate mitigation effects, the measures in this Action Plan also aim to strengthen the resilience of ecosystems to the ever graver challenges, in this way securing their climate mitigation effect. If we want to preserve and restore nature in Germany permanently, we must give it the opportunity now to recover and become healthy for the future.

Financing and enforcement structures

In the coalition agreement, the coalition parties agreed to develop the Federal Action Plan on Nature-based Solutions for Climate and Biodiversity and to provide sufficient funding from the Climate and Transformation Fund. It is particularly in the national interest to make a long-term contribution to climate action. To achieve its climate targets, within the scope of its responsibilities and budget, the German government must use the possibilities available for reducing greenhouse gas emissions.

On this basis, Chapter 6092 budgetary headings 686 31 and 686 32 of the Climate and Transformation Fund allocated four billion euros for measures under nature-based climate action. Programme expenditures totalling 590 million euros are estimated for 2023.

Existing measures and those not in need of funding or that are financed from funds available from the budgets of the individual ministries are included in the Action Plan. However, the Action Plan's main focus is on new measures funded through the Climate and Transformation Fund budgets referred to above. Duplication of funding and dual structures are ruled out. To ensure that is the case, potential overlaps with other funding programmes are reviewed during development of the funding guidelines and if necessary the objects of support are further specified or adjusted. The application review procedure of the individual measures furthermore requires confirmation from the applicant that no other government funding (including

promotional banks in the remit of the Federation/ KfW) is being used for the project in the funding application.

Nature-based climate action is also a task for future generations. Permanently preserving forests as diverse habitats, strengthening or revitalising the climate mitigation function and rewetting drained peatlands are actions that require us to plan for decades ahead. In light of this, many new and existing measures in the Action Plan are designed to be continued beyond 2026. Only long-term measures beyond 2026 will enable us to achieve the goals of the Federal Climate Change Act for the LULUCF sector.

The German government will use federal authorities, project executing agencies, project executing companies, development banks and scientific institutions to implement the support measures of the Action Plan. All measures named in or arising from the Action Plan in the remit of the Federation are to be implemented in the framework of the financial and human resources available in the Climate and Transformation Fund or the individual budgets of the federal government in accordance with the respective ministry responsibilities. In this process, the German government will observe the constitutional division of competences and coordinate the measures of the Action Plan with measures that lie in the responsibility of the *Länder*. The *Länder* have many years of experience in planning and implementing nature conservation and climate projects on the ground and already implement a range of funding programmes and support measures in the agriculture and forestry sector. The aim is to use the experience of the *Länder* to implement the measures of the Action Plan. One example of how the federal and *Länder* levels can work together is the Federation-*Länder* target agreement on climate change mitigation through peat soil conservation concluded in 2021.

All the support measures proposed in the Action Plan will undergo external evaluation (progress assessment). Where possible, the criteria needed to assess the output must be quantitatively defined and recorded. Ideally, outcome and impact must be derived quantitatively. Where possible, the criteria needed to assess the direct results of the support (output, for example number of planted trees compared to the figure without the measure) are defined and analysed quantitatively. The medium-term effects of the support measures of the Action Plan (outcome, for example net greenhouse gas emissions) and medium- and long-term effects on society for the mitigation of the impacts of the biodiversity and climate crises are also derived quantitatively where possible. This will be based on an Action Plan monitoring and evaluation strategy.

Links to other strategies and programmes

The Action Plan covers a wide range of content. It addresses a variety of different ecosystems with the aim of strengthening natural environments in Germany on a broad scale. For this reason, the Action Plan is linked to many other programmes and strategies of the German government. Thanks to their synergies, Nature-based Solutions can contribute to different goals and programmes of the German government at the same time. This Action Plan deliberately incorporates NbS that are already in place.

In particular, some NbS will be part of the climate action programme for the LULUCF sector. This applies to measures that have a particular impact on the net emissions of the land use sector. Under the Action Plan, these measures will be fleshed out in more detail and implemented.

The Action Plan measures will also be aligned in particular with

- the Immediate Action Programme for Climate Adaptation
- the new version of the National Strategy on Biological Diversity (NBS)
- the German Sustainable Development Strategy
- the National Water Strategy
- the National Peatland Protection Strategy
- the national Policy Plan on the EU Common Agricultural Policy (CAP)
- the Climate Action Plan 2050
- the German Adaptation Strategy
- the national biomass strategy and the national new forest strategy, both currently being drawn up, and the planned marine strategy.

It will also be coordinated with current, ongoing and planned federal funding programmes:

- Blue Belt Programme
- species recovery programme
- Federal Programme for Adaptation of Urban Spaces to Climate Change
- urban development funding programmes
- Climate Action Plan 2030.

There are also plans to fast-track nature restoration projects. This is intended to benefit implementation of the Action Plan and the other strategies and programmes mentioned. The goal is to identify potential barriers and, where necessary, shape the relevant legal framework in a way that enables certain NbS and nature conservation projects to be implemented more quickly. Burdens on existing areas with high value for nature-based climate action or nature conservation will be reduced, thereby facilitating their preservation for the long term.

At EU, international and *Länder* level there are also many processes, initiatives and agreements where nature-based climate action plays an important role. The links to the international and EU level are described in more detail in field of action 10.

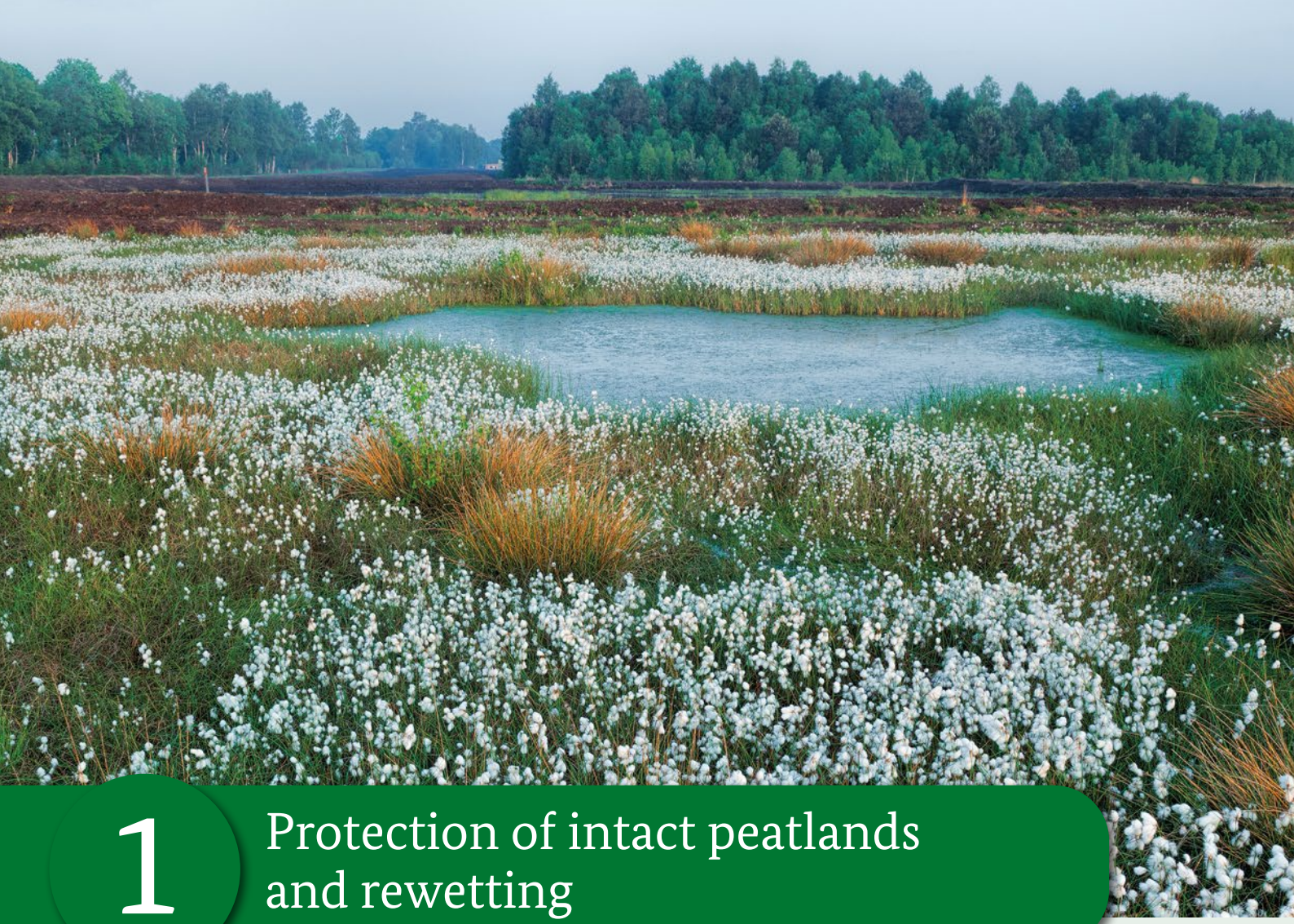
Dialogue and participation

The transformation to sustainable and climate-neutral lifestyles has an impact on every area of life. That is why it needs broad public support and must be underpinned by research and innovation. To ensure that the measures of the Action Plan are effective, there must be intensive and in-depth dialogue with all relevant stakeholders in administrations and associations, with farmers and foresters and with land managers, land owners and other affected groups. The experiences of local experts are particularly valuable.

In light of this, the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) put the draft up for discussion in a broad participatory process. All affected or interested groups had the opportunity to give their views on the scope and direction of the measures contained in the proposed Action Plan. The BMUV dialogue platform received more than 120 written opinions and over 1,100 individual comments. This feedback served as an important basis for the final version of the Action Plan.

However, participation does not stop with the finalisation of the Action Plan: in many of the measures it sets out, involvement of local communities is a key element. Particularly where far-reaching changes in current land use are imminent, a transition towards more nature-based climate action can only succeed if stakeholders work together. In the case of peatland protection, for example, this is even explicitly enshrined in the coalition agreement.

Fields of action for Nature-based Solutions for climate and biodiversity



1 Protection of intact peatlands and rewetting

Peatlands store large amounts of carbon over long periods of time: the remains of dead plants do not immediately decompose – as in dry places – but slowly turn into peat under the surface of the water where the carbon remains stored. As ecosystems, peatlands provide habitats for unique animal and plant species, which depend on these special living conditions.

In Germany, however, 92 per cent of peatlands have been drained. They are usually used as cropland or pasture land and for peat extraction. On contact with the air, the plant remains, which have accumulated over centuries and millennia, begin to decompose very quickly, releasing the trapped carbon as CO_2 in the process. In 2020, these emissions amounted to around 53 million tonnes of CO_2 equivalents, representing roughly 7.5 per cent of total national greenhouse gas emissions. In addition to the considerable emissions when peatlands are drained, native flora and fauna are lost along with the regulating effect on the water balance. Peatlands can store water in the landscape.

To reduce greenhouse gas emissions from drained peatlands, which are usually used for farming, the water levels have to be raised again. However, most of the few remaining near-natural and unused peatlands also have a poor conservation status. They need protection to ensure that they remain intact and can recover.

1.1 Implementing the National Peatland Protection Strategy

Ambitious peatland protection is a key component in climate action and biodiversity conservation. It also promotes adaptation to climate change. The most pressing need for action in peatland protection is rewetting drained peatland soils used for agriculture and forestry. The implementation of the necessary peatland protection measures represents a major challenge and will require considerable staff and financial resources from the various stakeholders in the coming years. On 9 November 2022, the German government adopted the National Peatland Protection Strategy. This strategy addresses peatland protection from the perspective of nature, water and soil conservation, climate change mitigation and adaptation and looks at the various options for use. It thus contributes directly to climate action and biodiversity conservation and gives the local communities long-term prospects.

The National Peatland Protection Strategy defines the policy framework for all aspects of peatland protection in Germany and combines the various measures. It addresses all aspects that fall under the responsibility of the federal government and integrates the content of the Federation-*Länder* target agreement on climate change mitigation through peat soil conservation. It serves as the basis for peatland protection measures in the context of nature-based climate action and is intended for all relevant stakeholders.

The National Peatland Protection Strategy is based on developments in peatland policy and science over the last years. It is in line with the current legal framework on climate action, various strategies relevant for peatland protection, such as the National Water Strategy, and with the Federal Action Plan on Nature-based Solutions for Climate and Biodiversity. The measures and goals are ambitious, but nevertheless practicable and balanced.

What the German government plans:

The measures of the National Peatland Protection Strategy will be implemented with the cooperation and support of the competent ministries.

The German government will work to

- Establish a pre-emptive right of the public sector to purchase peatlands,
- Develop and implement peatland protection measures on land owned by the federal government, taking respective purpose limitation into account,
- Improve legal and funding policy instruments for peatland protection and peatland soil conservation,
- Analyse practical experiences of the *Länder* (spatial planning, peatland protection planning, land consolidation procedures) related to peatland protection and peatland soil conservation,
- Provide targeted support for innovative photovoltaic projects on peatland sites where rewetting has been carried out or is planned, where this benefits nature conservation. Under the current Renewable Energy Sources Act, solar arrays on drained peatland used for farming are eligible for support if the peatland is rewetted in the course of erecting the photovoltaic modules.

1.2 Implementing the Federation-*Länder* target agreement on climate change mitigation through peat soil conservation and developing it further with the *Länder*

In 2021, the Federation-*Länder* target agreement on climate change mitigation through peat soil conservation was signed, laying down a greenhouse gas reduction target for peatland protection. The agreement centres on measures for the large-scale rewetting of drained peat soils. These measures are based on the principle of voluntary commitment. The aim is for new forms of farming and forestry to be possible and promoted on these areas, even after water levels are raised.

What the German government plans:

We want to establish a permanent Federation-*Länder* committee to monitor and coordinate implementation of the target agreement and to identify a priority list of measures for implementation. The packages of measures will be designed and implemented in close cooperation with the *Länder*, with the aim of achieving a reduction in annual greenhouse gas emissions of five million tonnes of CO_2 equivalents by 2030.

To monitor the climate mitigation performance of peat soil conservation, we will establish a measuring system to support the monitoring of peat soils as envisaged in the target agreement.

1.3 Improving the condition of unused and protected peatlands and financing renaturation measures

In peatland protection, priorities include rewetting drained peatland soils that are important for nature conservation, especially in protected areas, and improving the conservation status and restoring legally protected peatland biotopes and habitats of threatened species typical of peatlands. Despite various measures, in the past it has not been possible to stop or reverse the negative trend.

In the next few years, considerable improvements will be made through a number of measures and programmes, still to be developed, that are tailored to the needs of nature and biodiversity conservation. Federal measures will complement and support the existing activities of the *Länder* and be used to specifically promote the interests of the Natura 2000 protected area network.

This is also a key component of the National Peatland Protection Strategy.

What the German government plans:

In consultation with the *Länder*, we want to develop programmes and funding that specifically address the needs of nature conservation in peatland protection (renaturation with the aim of restoring ecosystems typical of peatlands). To this end, a set of measures will be drawn up for peatland rewetting, maintenance and connectivity, especially in protected areas, but also outside them. The focus is on long-range initiatives at measure and project level.

1.4 (Federal) programme for climate change mitigation through peatland protection on comprehensive rewetting projects with accompanying measures and support for locally adapted wet use

The Federation-*Länder* target agreement on climate change mitigation through peat soil conservation, concluded in 2021, focuses on measures for the large-scale rewetting of drained peat soils. To this end, cooperative and regionally tailored voluntary solutions will be developed and supported. The aim is for new forms of farming and forestry to be possible and promoted on these areas, even after water levels are raised. The measure is also a key component of the National Peatland Protection Strategy.

What the German government plans:

We will establish a permanent Federation-*Länder* committee to monitor and coordinate implementation of the measures. In consultation with the *Länder*, we will develop programmes and funding that specifically address the issues related to the use of drained peat soils for agriculture and forestry. This could take the form of an implementation and financing structure in the Action Plan, developed with the *Länder* using options available under constitutional and budgetary law.

To this end, a set of measures will be drawn up for large-scale peatland rewetting and conversion to new uses (peatland photovoltaics, paludiculture) and implemented on a voluntary basis.

1.5 Creating new value chains for paludiculture and product marketing

To successfully establish alternative forms of agriculture, such as paludiculture, on rewetted peatland, previously farmed as drained peat soils, there must be a market for the products. Paludiculture products compete with other goods and agricultural products on the market.

As formulated in the National Peatland Protection Strategy, different measures are needed to support the production of these kinds of goods on the one hand and to stimulate demand on the other. For reasons of resource efficiency, paludiculture must primarily focus on material use.

What the German government plans:

We want to take various goal-oriented measures and support private sector initiatives that develop sustainable products beneficial to society as a whole and sell these products on the market. We will use the lessons learned in the BMUV pilot projects and the Federal Ministry of Food and Agriculture (BMEL) model and demonstration projects for the development of new products and make them publicly available.

1.6 Agreements with the *Länder* on planning and approval issues for peatland protection

The most pressing need for action in peatland protection is rewetting drained peat soils used for agriculture and forestry. It will be an enormous challenge to implement the necessary peatland protection measures. Implementation is usually hampered by long and complex planning and approval procedures. A review will be undertaken to determine current obstacles and enable any necessary amendments to be made to relevant legal regulations at federal and *Länder* level.

In this context, the National Peatland Protection Strategy has already identified various measures and there is an extensive need for action. In particular, suitable agreements with the *Länder* are needed to quickly implement the required rewetting measures. Identifying measures and making any necessary adjustments will speed up and streamline the procedures.

What the German government plans:

Working with the *Länder*, we will develop solutions to speed up and streamline procedures for rewetting measures. To this end, we will explore how peatland protection can be given greater consideration in spatial planning, for instance, whether designating priority or reserved areas for peatland protection and peat soil conservation would be useful and help speed up procedures. We will review hydroengineering plans and investments in peatland areas to prevent climate-harmful stranded investments in further draining projects.

1.7 Phase-out plan for extraction and use of peat and developing alternatives

Alongside draining activities, peat extraction and peat use are a significant source of greenhouse gas emissions. Germany is a global leader in the area of potting soil and substrate production. A federal strategy is needed that addresses both peat use and peat alternatives and creates a reliable and predictable framework for all stakeholders.

The BMEL's peat reduction strategy aims to set the policy framework for peat use in Germany and pools the various measures at federal level. For a largely smooth transition to peat-free soils, a planning timeline for commercial horticulture is needed for large-scale substitution by 2030. Peat use needs to be phased out of private gardening by 2026. Peat use will be reduced through agreements and voluntary measures.

It will require significant effort to identify and provide suitable peat alternatives. There is still a considerable need for research into alternatives for peat substrates in gardening. The BMEL and its research institutes are continuing to develop a programme of measures that makes it possible for all stakeholders to phase out peat use.

What the German government plans:

We will continue to implement the measures for reducing peat use. In particular, we will continue dialogue with the potting soil industry and launch an information and education campaign on the use of peat alternatives.

2 Near-natural water balance with vibrant rivers, lakes and floodplains

Intact water bodies – rivers and lakes – and their floodplains are hubs of biological diversity. Rivers and their floodplains can play a particularly important role in the biotope network. However, many rivers have been straightened and are practically cut off from their floodplains. Today, a good third of active floodplains are used for arable farming, settlements, transport infrastructure or commercial activities. Only nine percent of floodplains are ecologically intact.

In the protection of water bodies, particular advantage can be taken of the synergies of Nature-based Solutions: restoring water body systems and reconnecting floodplains secures refuges for a range of flora and fauna. At the same time, floodplains filter surface water and keep it in the landscape, thus preventing droughts. They provide flood protection in the form of retention areas.

As the climate crisis progresses, the availability of water is moving increasingly towards extremes: on the one hand, summers are becoming drier and there are more droughts. On the other hand, local heavy rainfall events occur with greater frequency and intensity. This can lead to disastrous flooding, as was the case in July 2021. These diverse impacts show that we need to fundamentally realign water management goals.

The aim is to keep more water in the landscape and scale back the rapid drainage of large areas. This not only helps to prevent local floods, droughts and forest fires. A larger and more evenly distributed supply of water also makes the existing ecosystems more resilient. It is often even the basic prerequisite for more extensive renaturation and restoration measures, for example rewetting peatlands.

In this context, it is also important to review the functions of river basin and land development associations in connection with maintaining drainage capacity. Forests are vital here because they prevent rapid surface run-off, thus playing a key role in groundwater recharge.

To improve the resilience of river landscapes, we must have an even greater degree of joined-up thinking on water bodies and floodplains. Cooperation and cross-sectoral approaches are needed to fully exploit the natural potential of water body landscapes.

2.1 Developing guiding principles for regional, near-natural water balances

Guiding principles for regional, near-natural water balances are important for the design and goals of implementation strategies, for instance regional water supply plans. To obtain comparable statements in all regions of Germany, a standard methodology for drawing up specific guiding principles for regional, near-natural water balances will be developed. This will contain proposals for categorising the near-natural water balance by region using different natural environments, describe the requirements profile for regional guiding principles and outline which hydrogeological, hydrological, ecosystem-related and soil-related data and modelling will be included.

Case studies will be used to test whether the methodology can be applied and transferred elsewhere. A special focus will be on the integration of low water aspects, such as how a near-natural water balance can potentially mitigate low water levels.

A dialogue with practitioners from agriculture, forestry, water management and water conservation and involving existing networks will consider whether the methodology can be implemented in practice. Educational materials will be developed on the basis of the discussion. Experts from water management, agriculture, forestry and nature conservation will jointly design training and education programmes for farmers and people responsible for water body maintenance. The education and training programmes will help reduce the negative impacts of agriculture, forestry and water body maintenance on water bodies.

To secure their success, measures relating to water conservation and landscape hydrology must be flanked by communication and environmental education measures. To increase acceptance, outreach activities under the United Nations Water Action Decade will be expanded and a voluntary network of experiential learning sites dedicated to water issues set up.

What the German government plans:

- Develop guiding principles and goals for a near-natural water balance on which to build water-sensitive land use based on the analysis of the regional water cycle, potential impacts of climate change, structure of the natural space and the surrounding area.
- Conduct dialogue with practitioners from agriculture, forestry and water management based on the guiding principles, with the aim of reviewing workability for land use and assessing demand for water in various uses. The results will enable adapted land use to be devised.
- Use the guiding principles to develop education and training programmes for agriculture and forestry, including gardening.
- Use the guiding principles to foster expertise of those responsible for water body maintenance to develop a culture of integrated water body maintenance which also considers water retention in general.
- Undertake educational and outreach activities on sustainable and near-natural landscape hydrology as part of the UN Water Action Decade and launch a network of experiential learning sites dedicated to water issues.

2.2 Setting up and implementing the funding programme "climate measures in water management and water body development"

Water management has a crucial role in climate adaptation. It is vital to both prevent risks, such as those posed by extreme weather events like flooding, heavy rainfall and persistent drought, and strengthen the resilience of water bodies and the water balance to the impacts of climate change.

Near-natural water body development, near-natural water balance, better general water retention, significant reduction in land sealing, improved infiltration, decentralised rainwater management, especially in urban areas, a reduction in surface run-off, prevention of extreme peak run-offs and the integration of water management measures in urban development all help mitigate the impacts of climate change and in particular the adverse effects of extreme weather events. These kind of measures have many potential synergies with the goals of the EU Water Framework Directive and with biodiversity conservation. The environment ministers of the *Länder* have repeatedly called for financial support from the Federation for such measures.

Examples of support are investments in adapting water infrastructure to the impacts of climate change and investments and measures for managing heavy rainfall, with a focus on restoration, renaturation and sustainable development of municipal water bodies in particular. The goal is to substantially enhance the adaptability of the water bodies to the impacts of climate change and improve the local microclimate and the chemical and ecological status of water bodies, including associated measures for sediment management. The measures seek to have positive effects on biodiversity and to create an attractive living environment around water bodies for the local community. The particular but not exclusive targets of the funding programme are municipalities, municipal companies, corporations and special purpose associations.

What the German government plans:

- Support for investments in adapting water management infrastructure to the impacts of climate change.
- Support for investments and measures for restoration, renaturation and sustainable development of water bodies – especially municipal water bodies. The main focus is on management of heavy rainfall and drought. The funding programme will be clearly distinguished from existing support instruments, especially the Joint Task for the Improvement of Agricultural Structure and Coastal Protection (GAK) and the Federal Programme for Adaptation of Urban Spaces to Climate Change. This will prevent the duplication of support.

2.3 Renaturing floodplains on watercourses (Blue Belt II)

Near-natural floodplains can help absorb carbon and remove it from the atmosphere. They are among the most species-rich ecosystems in Central Europe. Moreover, near-natural floodplains regulate run-off when water levels are high or low and can mitigate the impacts of the climate crisis on landscape hydrology. At present, however, they cannot fulfil these natural ecosystem functions adequately. Around the country, two thirds of the floodplains of Germany's 79 largest rivers are cut off from potential inundation by dikes. Eighty percent of the floodplain and water body habitats in Germany are under threat.

The immense potential of near-natural rivers and floodplains will be used for nature-based climate action, climate change adaptation and biodiversity conservation. Wherever possible, the aim is to preserve or restore near-natural rivers and floodplains. Nature conservation, climate change mitigation and adaptation (flood protection and improved landscape hydrology) must always be addressed together and taken into account when measures are implemented. Reclaiming and reconnecting functional natural retention areas and promoting sustainable forms of use are particularly important in this context.

What the German government plans:

To supplement existing support from the Blue Belt floodplains funding programme, in coordination with the *Länder* we will establish floodplain funding for other watercourses with special relevance for the biotope network and water management.

2.4 Ecological development of water bodies of the federal waterways

The ecological development of water bodies of the federal waterways is a prerequisite for many Nature-based Solutions, both in the immediate area of the major watercourses and in their adjacent floodplains. The immense potential of near-natural federal waterways to absorb carbon and remove it from the atmosphere will be used for nature-based climate action, biodiversity conservation and climate adaptation. Reconnecting floodplains can strengthen their resilience and increase their potential to sequester carbon.

In this context, measures to dismantle or convert technical bank reinforcements and the integration of water management measures in transport infrastructure planning can help mitigate the impacts of the climate crisis as well the devastating effects of extreme weather events. They also have great potential for synergies with the goals of the EU Water Framework Directive and with biodiversity conservation.

Funding from the Climate and Transformation Fund will also support model measures on the sustainable development of water bodies carried out on federal waterways by the Federal Waterways and Shipping Administration (Wasserstraßen- und Schifffahrtsverwaltung, WSV). These measures are implemented under the part of the Blue Belt Programme in the remit of the Federal Ministry for Digital and Transport. They will take the form of cooperative projects with partners in the *Länder*, municipalities and associations, or with the Federal Agency for Real Estate, and are intended to point the way for other measures of this kind.

What the German government plans:

We are reviewing how to support the WSV in dismantling and converting technical bank reinforcements along federal waterways and reconnecting backwaters and floodplains.

To supplement this, we will draw up maintenance and development plans for federal waterways, which will include Nature-based Solutions.

3 Seas and coasts

Marine and coastal ecosystems, including their habitats such as seagrass beds, salt marshes and kelp forests, as well as the sediments on the seafloor, sequester carbon naturally. In the long term they thus function as carbon stocks and sinks, fulfilling this function around the world to an even greater extent than terrestrial ecosystems. As habitats and nurseries for many marine species, intact marine ecosystems contribute to nature-based climate action.

However, our seas have a poor conservation status. Besides suffering from intensive use in some areas, pollution and accumulation of nutrients, the North and Baltic Seas are also affected by the climate crisis. Due to the climate crisis, they are becoming not only warmer and less well oxygenated, but also more acidic. This impacts the marine flora and fauna and living conditions in the water, leading to changes in the functional capacity of the ecosystems and making them less resilient. The growing adverse effects on the seas and coasts can have a negative influence on ecosystem dynamics, release additional greenhouse gases and thus further exacerbate the climate crisis.

We need to understand seas and their coasts as a foundation of life and an essential component of the climate system. We can enhance their natural functions by protecting seas and coasts, ensure they are used sustainably and increase their resilience to climate-related changes. This is the focus of the German government's marine protection initiative, and the marine and coastal measures of the Action Plan on Nature-based Solutions for Climate and Biodiversity make a key contribution.

We also need to learn more about the complex relationships between ecosystems in the North and Baltic Seas. To that end, we will develop the findings of research projects, for example the accompanying research by the German Marine Research Alliance supported by the Federal Ministry of Education and Research (BMBF). We will build on this research together and implement measures at the interface of nature-based climate action and marine conservation. We must use the knowledge already available for immediate action.

Moreover, information and experiences can be shared, for instance in exchanges with EU partner countries.

3.1 Preserving and restoring salt marshes: creating synergies between nature conservation and coastal protection

Salt marshes naturally remove carbon from the atmosphere in the long term and increase the amount of sediments in the coastal area, thereby playing an important role in nature-based climate action. At the same time, they provide habitats, especially for many bird and insect species and endemic plant species, making them important for biodiversity. As natural salt marsh areas are progressively lost, less CO_2 is captured. Salt marsh drainage ultimately leads to the release of previously sequestered methane and CO_2 into the atmosphere. For centuries, salt marshes have been a nature-based, immanent element of the coastal protection system, helping to stabilise and maintain the coastline for the long term. Moreover, they weaken the force of large waves (for example, during storm surges) and thus play a role in alleviating the pressure on dikes in coastal areas and protect them from major damage. Increasing flood frequency and the associated transport and deposit of sediments cause salt marshes to grow faster in height, which to a certain extent can compensate for the accelerated sea level rise. Nevertheless, the rise in sea level poses a threat to these important natural spaces and to their protective function for the coast. Measures to preserve them must therefore also consider long-term adaptation to climate change in coastal protection.

By conserving or renaturing salt marshes and using them in a nature-compatible way, we can preserve and restore their original climate function.

What the German government plans:

We will work with the *Länder* to develop an integrated approach to the protection, recovery and restoration of salt marshes at the Baltic and North Sea coasts that reconciles the interests of nature conservation and coastal protection. Our focus will be on renaturing salt marshes. We plan to build on existing programmes, draw on current research and development projects and reduce stress factors. In this process, we want to bring stakeholders into dialogue with each other to foster mutual understanding and raise awareness of the role of salt marshes as carbon sinks.

3.2 Preserving and restoring seagrass beds

Sea grasses and the increased sedimentation that they cause play an important role in the natural long-term sequestration of carbon in sediment, as their root systems store large quantities in the seafloor. At the same time, they provide habitats for many marine and brackish water species and are important for biodiversity. Their destruction can lead to the release of additional CO_2. The natural development of seagrass beds is impaired by newly introduced species, over-fertilisation, pollutants, waste, changes caused by the climate crisis and other anthropogenic activities such as tourism, dredging, sediment transports, coastal structures, some fishery activities and laying of cables and pipelines.

Both effective protection and renaturing are needed to preserve the natural climate functions and ecosystem services of seagrass beds. To ensure better growing conditions, we need to improve the ecological status of coastal waters and reduce pressures. This process must take account of the national management plans under the EU Water Framework Directive (WFD) and the national action plans under the EU Marine Strategy Framework Directive (MSFD).

What the German government plans:

Together with the *Länder*, we will launch a recovery programme to preserve and renature seagrass beds. To this end, we want to implement measures in pilot sites, identify the area potential and ways to reduce stress factors in the North and Baltic Seas and consider conflicting and common user interests. Factoring in the latest research findings and progress of projects, we want to gain a better understanding of the dynamics of environmental conditions and trends in climate-related changes. We want to use this knowledge to develop recommendations for action or models for the natural development and renaturation of seagrass beds in other areas.

3.3 Evaluating the climate function of kelp forests

Macroalgae mainly sequester carbon in plant biomass rather than in seafloor sediments. In that sense, they have great potential as carbon sinks, although the carbon is actually stored outside their habitats. This is because, for example, currents carry the biomass to other parts of the sea or onto land. The sequestration potential depends in part on the rate of decomposition during transport and how efficiently carbon is stored at the sites where the biomass is deposited. More research is needed on the total carbon balance and possible methane emissions of macroalgae that wash up onto shore.

In addition, kelp forests contribute to biodiversity conservation and ecosystem services. However, macroalgae close to shore are susceptible to the impacts of anthropogenic interventions, such as poorer water quality caused by nutrient inputs, invasive species, altered morphology and hydrodynamic conditions, and construction on the coast. Climate-related warming and acidification also have a debilitating effect on the macroalgae.

What the German government plans:

To better assess the potential of macroalgae as carbon sinks and gain a greater understanding of how environmental conditions, pollutants and climatic changes influence this potential, we want to join with the *Länder* in promoting research and monitoring in pilot sites in the North and Baltic Seas. Specific and practical plans for measures and implementation will be developed for these pilot sites. We will consider conflicting and common user interests and draw up recommendations for action or models for the natural development and renaturation of other macroalgae areas.

3.4 Evaluating the climate function of marine sediments and establishing carbon protection zones

Marine sediments absorb large amounts of carbon and have the capacity to store it for a long period of time. Marine and coastal sediments make an essential contribution to nature-based climate action as blue carbon ecosystems. These especially carbon-rich areas must be preserved.

The sediment type is an important factor in the carbon balance. Silty sediments have a higher carbon content than sands. In addition, the sedimentation of materials containing carbon is affected when sediments are mixed, for example by storms, wind and wave conditions, tidal currents and anthropogenic uses. The natural carbon storage capacities of marine sediments under the different oceanographic conditions, anthropogenic influences and possible interdependencies have yet to be determined.

What the German government plans:

We will evaluate the carbon balance and carbon sequestration potential of marine sediments, taking ongoing research into account. We will develop a standardised measurement method for marine carbon inventories in European and national seas, including coastal waters. Building on this knowledge, we will define marine areas with carbon-rich sediments and develop a possible legal framework for designating carbon protection zones in future. In addition, we will research and quantify the function of marine sediments with regard to other greenhouse gases (methane).

3.5 Bottom trawling and carbon storage capacity of the seafloor

Bottom trawling, under some circumstances even low-intensity bottom trawling, can disrupt the carbon storage function of marine sediments, as it changes the species composition on the seafloor (benthic communities) and disturbs the surface and structure of the sediment, causing organic material and nutrients to re-mineralise. The degree of damage depends on factors such as fishing gear and seafloor type.

The short-term effects of certain forms of bottom trawling in the North and Baltic Seas on carbon stored in benthic communities and sediment are currently being studied in BMBF-funded research networks as part of a research mission of the German Marine Research Alliance. However, neither the short-term impacts of other types of fishing gear, nor the long-term effects in German seas are currently known. A comparison of fished areas with the exclusion zones for bottom trawling in the North and Baltic Seas planned at EU level will build on the available findings and inform the evaluation of the impacts on the seafloor, including in relation to carbon emissions.

What the German government plans:

We want to continue the studies currently underway and develop a long-term monitoring programme on the effects of bottom-trawling exclusion zones on different marine areas. Another element is modelling the pressures of fishery and its effects on different seafloor types, with reference to Measure 3.4. In addition, we want to develop and implement measures to reduce carbon emissions in pilot sites and create incentives to limit bottom trawling and switch to other fishing techniques.

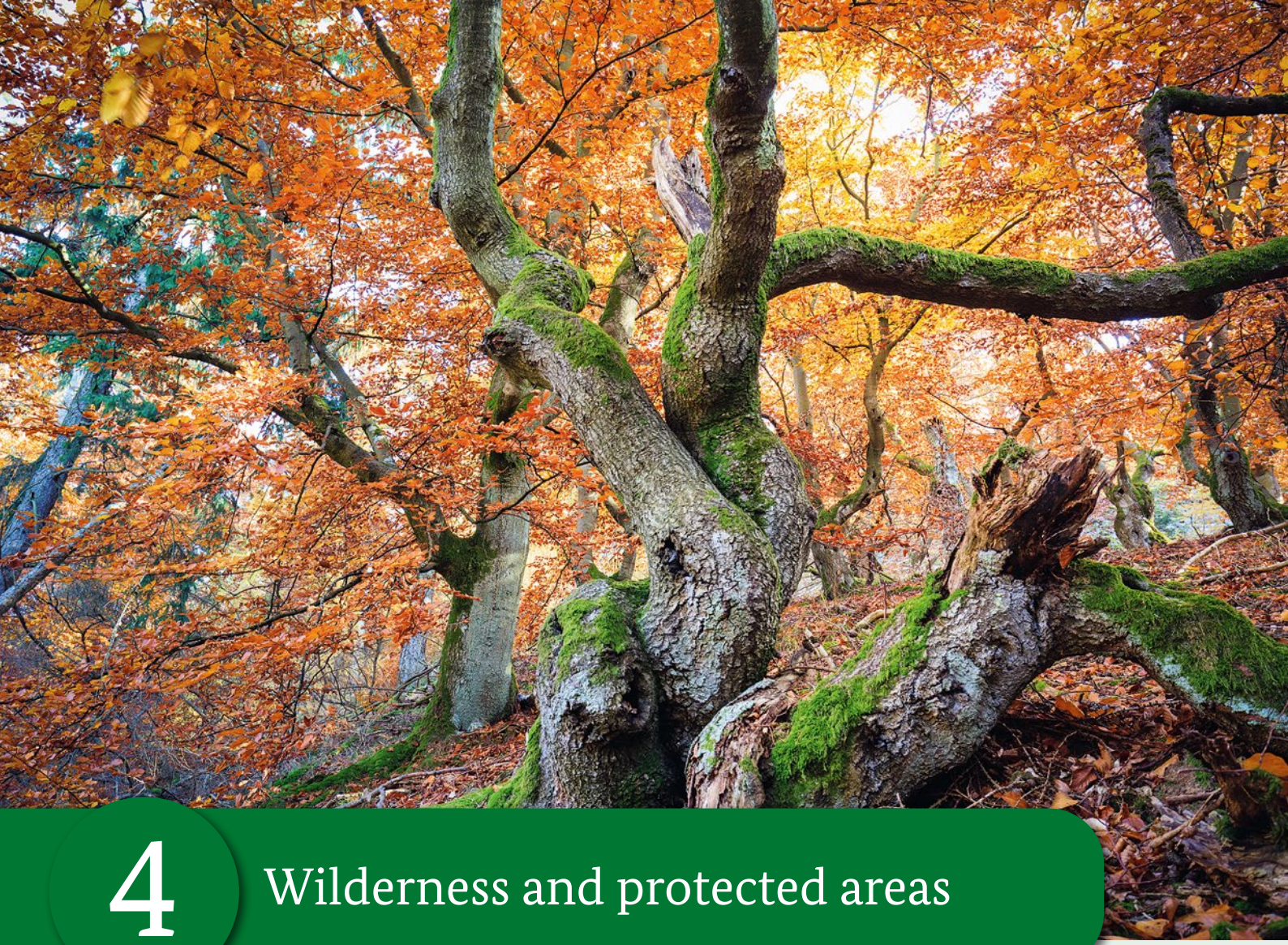
3.6 Carbon capture by different marine biotopes and the impacts of the climate crisis on marine biodiversity in the North and Baltic Seas

The potential of offshore marine biotopes to store carbon is not yet sufficiently understood. Climate-related factors (such as warming, acidification, oxygen deficiency) are altering the composition and distribution of their marine communities. A shift to the north of species' ranges, immigration of species from warmer areas and an exodus of shallow-water species to deeper, cooler zones will lead to changes in marine ecosystems and their functions. However, the impacts on the carbon balance are not yet sufficiently known.

It is a similar case for other offshore biotopes such as biogenic reefs, including the European oyster which, though native to our marine waters, has disappeared from German seas, the immigrant species Pacific oyster and the blue mussel. According to initial findings, these reefs have the ability to store carbon over the long term and thus contribute to nature-based climate action. Nevertheless, their function as a carbon sink is still a controversial subject in the scientific community. In view of increasing storm events due to the climate crisis, biogenic reefs could have an important function, as they act as breakwaters that protect coasts. Moreover, species such as oysters filter huge volumes of seawater. This could counter the increased occurrence of toxic algal blooms caused by climate change. Blue mussel and oyster reefs also serve as nurseries for different species of plants and animals and develop a typical diversity of species over the years.

What the German government plans:

Taking research into account, we will investigate the potential of offshore biotopes in the North and Baltic Seas, including biogenic reefs such as mussel and oyster beds, to sequester carbon for the long term and assess their reactivity and function as sources or sinks. We also want to advance the reintroduction of the European oyster. In addition, the impact of the climate crisis on marine biodiversity and changes on carbon storage will be analysed.



4 Wilderness and protected areas

Areas where nature can evolve naturally over the long term are vital for biodiversity conservation and valuable for implementing Nature-based Solutions. The aim is to preserve habitats through sufficiently large protected areas. Moreover, strong connectivity between protected areas is important to ensure the resilience of the entire protected area network. Even smaller areas with natural dynamic development and small-scale protected areas could make an essential contribution here. One of the targets of the Global Biodiversity Framework is to conserve 30 percent of global terrestrial and marine areas by 2030. NbS will help improve the quality of existing protected areas and implement the global target at national level.

The EU Biodiversity Strategy calls for ten percent of European land and marine areas to be placed under strict protection by 2030. Wilderness areas and smaller sites that are left to develop completely naturally are of particular importance for achieving this target, but habitats that depend on use, such as extensively farmed, species-rich meadows or large pasture landscapes, can also play a role.

Protected habitats have particularly positive effects when they have a favourable conservation status. This is not yet fully the case for many German protected areas. To take more effective action in this area, we will improve the planning conditions and conceptual basis for the management and maintenance of wilderness and protected areas.

4.1 ClimateWilderness programme – preserving small areas with natural dynamic development

The existing Wilderness Fund focuses on large-scale areas to help meet the two-percent wilderness target. The ClimateWilderness *(KlimaWildnis)* programme focuses on small areas that are not covered by the Wilderness Fund: there is an immense need to create carbon stocks and greenhouse gas sinks with high nature conservation quality in both large and small wilderness areas with natural dynamic development. The best possible synergies between biodiversity conservation and climate action can be created by securing (through land purchase and land rights) the natural development of sites in different habitats, including in protected areas, and ensuring connectivity of these sites. The programme can generate synergies with other measures, for example the protection of old-growth, near-natural beech forests (Measure 5.4) or the creation of ClimateWilderness ambassadors (Measure 4.3).

What the German government plans:

We intend to launch a programme to preserve smaller wilderness areas, for example in forests, peatlands, floodplains, mountains, on coasts, on former military training areas and in post-mining landscapes. The aim is to provide funding to protect areas with natural dynamic development that are smaller than 1,000 hectares in size (less than 500 hectares for alluvial forests, coasts and peatlands).

4.2 Limiting legal hurdles and incidental and consequential costs in wilderness areas

A large number of legal regulations obstruct implementation of wilderness targets or may pose major obstacles for the owners or managers of wilderness and smaller areas with natural dynamic development. This is especially true in wilderness areas, because use of the resources in these areas for commercial, material or energy purposes is prohibited. It is vital to identify and where possible adapt regulations which can encourage more land owners to preserve areas for wilderness or that support the efforts of people actively working in wilderness protection and simplify management of National Natural Heritage sites. Possible examples are stipulating process protection as a follow-up use for nature conservation in post-mining landscapes or exempting wilderness areas from water and land rates.

What the German government plans:

We will – to the extent possible – limit legal hurdles to wilderness development and incidental and consequential costs for owners of wilderness areas and we will protect wilderness areas as a follow-up use in post-mining landscapes.

4.3 ClimateWilderness ambassadors

In the (further) development of wilderness areas, a strong local presence is necessary that can, for example, promote the idea and goals of nature-based climate action, liaise closely with landowners and farmers to harness potential for wilderness development, establish contacts, build networks, provide information on funding opportunities and thereby act as a multiplier (local "caretakers"). This can create opportunities for land consolidation and inform the public and visitors about wilderness and nature-based climate action. A central office (ClimateWilderness Centre) will coordinate the ClimateWilderness ambassador network. Synergies with the establishment of regional agencies for nature-based climate action (Measure 9.6) will be used.

What the German government plans:

We will set up a ClimateWilderness Centre and review funding options for establishing a network of local ClimateWilderness ambassadors, giving due consideration to existing advisory structures such as those of the *Länder*.

4.4 Creating and implementing a national restoration plan as part of the EU's restoration goals

On 22 June 2022, the European Commission presented a draft nature restoration regulation, containing binding restoration targets. In addition to improving the status of ecosystems, the draft highlights their importance for climate, water balance, soil health and disaster preparedness and protection. The legal instrument will thus be a significant component of nature-based climate action.

The creation and implementation of a national restoration plan is envisaged as a core element of the legal instrument. The plan will combine and coordinate levels (federal, *Länder*, local), as well as restoration measures in all habitats and landscape areas (including the EU Habitats Directive habitat types, forests, peatlands, rivers, floodplains, agricultural landscapes, urban green spaces, coasts and seas). It will thus involve a multi-sectoral, multi-level approach with a high degree of planning, coordination and communication. It will require a complex process of gathering, collating and analysing data from all sectors. Stakeholders will be effectively involved at an early stage.

What the German government plans:

In 2023, we will establish a funding programme to support structures and measures for data collection, planning, dialogue processes, consultation, implementation and monitoring at all levels (federal, *Länder*, local) for the creation and implementation of the national restoration plan.

4.5 Strengthening protected areas for nature-based climate action: integrating Nature-based Solutions in protected area management

Protected areas make an important contribution to climate action. They encompass large parts of the ecosystems in Germany that play a particularly important role in nature-based climate action. In Germany, for example, a substantial number of forests, peatlands, active floodplains, extensive grassland and marine ecosystems are located in protected areas. These habitats have positive effects, especially when they have a favourable conservation status, which is unfortunately not fully the case for many of them.

Integrated plans for Nature-based Solutions in protected areas therefore aim to increase the share of ecosystems in protected areas that simultaneously support climate change mitigation, adaptation and biodiversity conservation, thus improving the quality of these protected areas. It is also important to safeguard these habitats through sufficiently large protected areas, to link them with functional habitat connectivity structures and integrate them into the surrounding landscapes to increase the resilience of the protected areas network. The plans can also include buffer zones and identify measures from other areas of the Action Plan that need to be integrated into protected area management and designed together with relevant local stakeholders. Climate managers for protected areas will support the performance of these tasks.

Protected areas are an important cross-cutting issue in the context of nature-based climate action and are ideal for implementing measures to preserve and restore ecosystems, thus ensuring the permanence of the measures. This is why the EU protected area targets for 2030 also establish a close link to nature-based climate action and the associated restoration measures. The action plan on protected areas will define and supplement Germany's contributions to achieving the goals outlined in the EU Biodiversity Strategy.

What the German government plans:

By 2026, we will launch an action plan on protected areas together with the *Länder*. We will explore funding options for integrated plans for NbS in protected areas and for climate managers who can support existing protected area administrations or other local institutions in developing plans for NbS.

5 Forest ecosystems

Forests can sequester large volumes of greenhouse gases. Trees, like all plants, remove CO_2 from the atmosphere, convert it through photosynthesis and release oxygen. The resulting carbon compounds are stored, leading to the formation of wood – and the tree grows. That is the basis for the sequestration of large quantities of carbon in forests. The carbon stock in Germany's forests is divided between above-ground and below-ground biomass. At the same time, near-natural forest ecosystems are important habitats for many species of flora and fauna and also improve the local climate and landscape hydrology. Forests also serve as important recreational areas for people and supply wood as a renewable raw material. To facilitate an ecologically sound expansion of wind energy, forest sites must be selected very carefully. Intensively used commercial forests (such as spruce and pine forests) lend themselves more readily to this use, as they are often less important for nature conservation or recreation.

However, the last National Forest Inventory identifies only 36 per cent of Germany's forest as near-natural. The findings of the National Forest Inventory currently underway will show how this figure has been affected by factors such as the drought years since 2018. In recent years, non-natural forests in particular have proven to be especially

susceptible to drought damage and pest infestation. The systematic conversion of non-resilient forests and restoration of damaged forest areas will lead to near-natural, climate-resilient forest ecosystems. The climate change adaptability and resilience of forests hinge on the biodiversity and structural richness of near-natural forest ecosystems.

In addition, we want to expand forest cover in Germany. This will allow us to increase the long-term capacity of forests to sequester carbon and create habitats with lasting value. It will also contribute to the goal of planting three billion new trees in Europe, as laid down in the EU Biodiversity Strategy for 2030 and the EU Forest Strategy. Furthermore, increasing forest cover enhances landscape diversity and the habitat quality for many species, thus in some cases also improving habitat connectivity.

5.1 Increasing forest cover to promote biodiversity

Increasing forest cover (new afforestation) is currently supported by the Federation and *Länder* through the Joint Task for the Improvement of Agricultural Structure and Coastal Protection (GAK). This measure is considered suitable for enhancing the function of forests as carbon reservoirs and sinks for the long term, thus advancing the goal of climate neutrality. Regions with low forest cover lend themselves in particular to this measure. At the same time, increasing forest cover has the potential to improve structural diversity in the landscape, habitat connectivity and thus habitat quality for many species. This also achieves positive effects, for example on the local water balance, as forests also curb surface run-off, store water and thus ensure that water is dispersed equally. Care must be taken that the increase in forest cover is not achieved at the expense of ecologically valuable open landscapes.

Since the forest provides wood as a renewable raw material and wood processing secures jobs, especially in rural areas, this measure is generally suitable for supporting structures in rural areas for the long term. The EU Biodiversity Strategy and the EU Forest Strategy include the target of planting an additional three billion trees – 120 million of these in Germany on up to 100,000 hectares. The United Nations Strategic Plan for Forests 2017-2030 goes one step further, aiming to increase global forest area by three percent by 2030. In Germany, that would be an increase of around 340,000 hectares. It is in Germany's interest to make a positive contribution to reaching these goals. The measure maximises synergies between climate change mitigation and biodiversity conservation.

What the German government plans:

Through an exchange between the Federation and *Länder*, we will identify and implement approaches for extensive new afforestation on suitable areas, possibly in pilot regions, primarily using criteria that promote biodiversity. The corresponding funding area under the GAK will then be phased out in close coordination with the *Länder*.

5.2 Creating species-rich, near-natural and climate-resilient mixed deciduous forests through forest restoration and conversion

The damage to forests caused by drought and other disasters since 2017 has also drawn attention to the general condition of forests, leading to the recognition that large parts of Germany's forests suffer more from the impacts of climate change because they are not sufficiently close to their natural state. As extreme weather events become more frequent and conditions at sites change as the climate crisis progresses, it is imperative that we better adapt our forests to climate change by accelerating the forest conversion already underway and restoring degraded areas to species-rich, climate-resilient forests. This can include measures for improving the local water balance. This measure addresses both forests in protected areas and managed forest areas.

As part of the German government's climate action package to promote near-natural forest management and remedy damage caused by extreme weather events, the BMEL has made 480 million euros available under the GAK to support private and municipal forest owners. The measure is co-financed by the *Länder*, meaning total funding of around 800 million euros has been made available up to the end of 2023.

What the German government plans:

In addition to the above measures, the German government is also considering further programme expenditures under the Climate and Transformation Fund for Nature-based Solutions relating to forest conversion and reforestation. Insofar as constitutional and budgetary law allows, these could take the form of support in the same quality and quantity as the GAK programme and implemented with the *Länder* through a joint implementation and financing structure under the Action Plan. The corresponding funding area under the GAK will then be phased out in close coordination with the *Länder*.

5.3 Financial incentives for additional climate and biodiversity services in forests

The climate change adaptability and resilience of forests hinge on their biodiversity and structural richness. These must be promoted with active, climate-adapted forest management. Private and municipal forest owners must be supported in strengthening the resilience and climate change adaptability of forests, enhancing forest biodiversity and preserving the valuable natural carbon stocks in forests. The required activities go beyond the previous standard of forest certification schemes and thus help to encourage additional climate and biodiversity services in the forest.

What the German government plans:

In addition to the funding programme intended to speed up the conversion to climate-adapted forests, we plan to develop an additional funding instrument to supplement the existing support programme. This creates tailored financial incentives for achieving desirable conditions such as greater structural richness and biodiversity in forests that are already near-natural, also with a view to partially more extensive forest management. In this way, the support instrument contributes to further stabilising and enhancing carbon sinks in climate-stable, ecologically valuable forest ecosystems.

5.4 Protecting old-growth, near-natural beech forests

Under the coalition agreement, the German government is committed to stopping logging in old-growth, publicly owned, near-natural beech forests.

This will be implemented in a first step on land owned by the Federation. The contribution of the other public forest owners, namely the *Länder* and municipalities, will be made through a voluntary alliance. Options for private forest owners who want to contribute to the conservation of old-growth, near-natural beech forests will also be evaluated. Appropriate long-term funding is needed for overall implementation.

As well as supporting nature-compatible management of beech forests, the measure also supports nature-based climate action by preserving ecologically valuable, natural carbon sinks, also in protected areas. The EU Biodiversity Strategy includes the goal of identifying and protecting old-growth forests. The measure thus creates synergies between climate action and biodiversity conservation.

What the German government plans:

We will implement a logging ban in old-growth, near-natural beech forests on federally owned land that has not been earmarked for a specific government purpose. We want to approach the *Länder* through a voluntary alliance and create funding opportunities for municipal and private forest owners as well.

Soils as carbon stocks 6

Soils are the main land-based carbon stocks. They play an important role in the release and sequestration of greenhouse gases, especially CO_2. Healthy soils also strengthen the resilience of ecosystems to the climate crisis. Soil conservation and soil-friendly management that improves humus content prevent soil-derived greenhouse gas emissions and stabilise or increase the organic carbon content of soil.

Agriculture, which is the main land use in Germany, has a special role to play here. Impacts on soil vary greatly according to the type of farming being practised. Soil management must seek to enhance the capacity of soils for nature-based climate action as carbon stocks, filters and water reservoirs, and to preserve and promote soil biodiversity. The same applies to forestry. Not least, more careful management of our soils is crucial for securing our basic food supply in the long term. This should exploit the synergies between Nature-based Solutions and the expansion of renewable energies. For example, agri-photovoltaics can help ease tensions in competition for land, especially when it comes to land used for agriculture.

6.1 Systematically promoting the preservation and creation of structural elements and areas, especially in agricultural landscapes, with a positive impact on climate and biodiversity (hedges, hedgerows, agroforestry systems, tree rows and copses)

To achieve the annual emission balance targets for the LULUCF sector as set out in section 3a of the Federal Climate Change Act, integrated structural elements and areas will be maintained and expanded. Compared to cropland in particular, hedges, hedgerows, tree rows, copses and agroforestry systems contain more humus, which means they have a greater capacity to store carbon in the soil. They also sequester carbon in the woody vegetation for a longer period of time. In addition, they have other, positive ecological effects: they reduce erosion (including humus removal) on adjacent cropland, stabilise the water balance (including dew formation) and the microclimate of the surrounding area, reduce nutrient discharge into water bodies and greatly increase biodiversity in the landscape. Especially in the second half of the last century, there was a considerable decline in these structural elements.

Today, the preservation of hedgerows and similar landscape elements is enshrined in regulatory and funding legislation (under the EU Common Agricultural Policy), but stepping up expansion of the areas requires more funding. Existing GAK funding measures show that these have not been adequate so far to achieve the desired area increase. In addition to sufficiently generous funding per hectare, it is advisable to provide initial and ongoing (nature conservation) planning and consultation and, if necessary, ensure cooperation between agriculture and nature conservation to achieve the greatest possible synergies.

What the German government plans:

We will step up support for the creation and maintenance of permanent field copses, hedges and tree rows, orchards and agroforestry areas. We will clearly differentiate this support from existing funding measures, particularly those under the GAK, and avoid duplicating support structures.

6.2 Further expanding organic farming

Organic farming is a resource-efficient and environmentally compatible form of farming that is guided by the principle of sustainability and circular economy. Organic farming therefore has considerable potential to help build up and maintain humus layers, thus preserving and restoring soil fertility, improving soil life and the water balance and reducing erosion. The formation of humus sequesters carbon in the soil, making a contribution to climate change mitigation. For example, eliminating the use of synthetic chemical pesticides also helps increase biodiversity. Organic agriculture's contribution to nature-based climate action lies particularly in the build-up of humus.

In addition, the system-based approach of organic farming generally leads to lower greenhouse gas emissions per unit of land (CO_2 equivalent per hectare) than conventional production. By not using mineral fertilisers, organic farming requires less fossil energy and therefore achieves greater independence. It sets high standards in livestock farming with a focus on animal husbandry that is appropriate for the amount of land available and on animal welfare.

What the German government plans:

The coalition agreement envisages expanding organic farming to 30 percent of agricultural land by 2030 (previous target 20 percent). To sharpen its focus on the higher target and strengthen organic farming further, the "Organic Farming – Looking Forwards" strategy will be further developed into a government strategy. To this end, we will first evaluate and realign the strategy's existing measures in a participatory process.

We will then also look at other fields of action across all ministries and identify key policymaking levers to strengthen the organic food sector in Germany. For instance, the Federal Organic Farming Scheme and other forms of sustainable agriculture (BÖLN) has returned its focus to promoting organic farming measures, as in the years 2002 to 2010. It is continuing as the Federal Organic Farming Scheme. We will also further develop the protein crop strategy, as legumes play a crucial role in soil fertility and nitrogen fixation, in both organic and conventional farming.

6.3 Amending the Federal Soil Protection Act (BBodSchG)

Soil can play a significant role in adapting to the climate crisis and mitigating its impacts. Peatlands and soils used for agriculture in particular have enormous potential for carbon sequestration. Functional soils can mitigate certain impacts of the climate crisis, such as the increasing effect of heat accumulation in urban areas in summer or flooding after heavy rainfall events. Measures to preserve and enhance carbon stocks in the soil also improve soil quality, biodiversity and agricultural productivity and increase the resilience of ecosystems to the climate crisis.

However, through land use change and unsustainable use and management, soils can also be a source of greenhouse gas emissions or completely lose their carbon sink function as a result of devastation and soil sealing. Sustainable soil management that enables the formation of carbon stocks or preserves carbon stocks typical to specific locations is essential for climate change mitigation.

The Federal Soil Protection Act has largely remained unchanged since it entered into force nearly 25 years ago. Its main focus is hazard control and remediation of contaminated soils and is sometimes referred to as the contaminated sites act (Altlastengesetz). However, it is currently lacking in precautionary measures and non-material aspects. The natural soil functions defined in the Federal Soil Protection Act do not adequately reflect the role of soils in climate processes. Therefore, the Federal Soil

Protection Act will be updated with a particular view to meeting the new challenges of climate change mitigation and adaptation and biodiversity conservation. To this end, natural soil functions, especially those benefiting climate action and adaptation, will be more firmly enshrined in the law. Conservation of soil biodiversity, a prerequisite for healthy and fertile soils, will also be strengthened.

Compared to other areas of law, the system underlying the Federal Soil Protection Act is complex. For this reason, we must also review aspects such as the role played by other legal areas in ensuring that soil is (adequately) protected and identify any areas where soil protection may need strengthening. We are also considering the possibility of designating soil protection areas to preserve the soil functions of especially important soils for future generations as well. This will not be linked to an absolute development freeze, but will, for instance, aim to give highly productive soils more systematic protection from being built on and lay down more stringent standards for compensation measures and land-saving construction methods that keep soil sealing low. The potential of the Soil Protection Act to help minimise soil sealing and facilitate de-sealing will also be examined. Legal bases for comprehensive soil monitoring and exchange of soil data will be created.

What the German government plans:

We will evaluate the Federal Soil Protection Act and adapt it to meet the challenges of climate change mitigation, adaptation and biodiversity conservation. This will take into account the different uses to ensure that it adequately reflects the importance of soil for nature-based climate action and for adapting to the impacts of the climate crisis.

6.4 Strengthening soil biodiversity as an essential contribution to nature-based climate action

The services of soil organisms are extremely important for climate change mitigation, as they are largely responsible for the formation of soil and humus. Humus is essential for both climate change mitigation and adaptation to changing climatic conditions, because it sequesters carbon and contributes to healthy soil hydrology. The diversity of soil organisms is established in different forms and typical compositions in the habitat types (biotopes) of the landscape. To assess how they have changed due to the climate crisis, we need a habitat-specific reference for good ecological soil status. However, due to a lack of information on soil biocoenoses, it is not possible to adequately assess the diversity and vulnerability of soil life. Comparisons of existing data across networks often fail because standards and uniform methodologies are lacking.

What the German government plans:

We will harmonise methodological standards and conduct a baseline survey for different types of land use in order to collect habitat type-specific soil biological reference data for good ecological soil status, derive suitable measures for climate change mitigation and adaptation to the climate crisis and develop measurable indicators to assess progress, effectiveness and efficiency of the measures. A nationwide soil biodiversity monitoring network will be established in close cooperation with the German Environment Agency (UBA), the Federal Agency for Nature Conservation (BfN), the National Centre for Biodiversity Monitoring, the Thünen Institute, the Julius Kühn Institute and the planned new National Soil Monitoring Centre. Activities already underway will be incorporated into the network.

6.5 Machines and equipment for strengthening natural soil functions in agricultural landscapes

The soils of agricultural landscapes hold significant potential for natural carbon storage, especially in the form of humus. More of this potential can be tapped with modified farming methods. Agriculture needs healthy soils to enable farming to be generally sustainable for the long term. Sustainable soil management tailored to the site ensures that natural soil functions are preserved and has an important role in nature-based climate action. Intensive tilling and excessive pressure on soil disrupts both soil structure and soil life. This in turn hinders humus formation and does not sufficiently harness the carbon sequestration potential.

Investments in machinery and equipment for conservation tillage, for reducing soil pressure, for mulching, mechanical weeding and extensive grassland farming are important for the long-term conservation of soil structure and soil life and thus for facilitating carbon accumulation in soil. This also promotes the capacity of the soil to retain nutrients and water. In the context of climate adaptation, this makes a significant contribution to reliable crop yields in agriculture, where growing conditions have become more difficult as a result of climate change. Support for machinery for insect-friendly mowing (cutter bars and finger bar mowers) can lead to synergies with the expansion of renewable energies, as such machinery is also particularly suited to agri-photovoltaics.

What the German government plans:

Targeted support for investments in suitable machinery and equipment is an important contribution to strengthening the natural functions of soil, including as a carbon sink. We will clearly differentiate this support from existing funding measures, especially under the GAK and avoid duplication of support structures.

6.6 Strengthening the bases for de-sealing and land recycling

The coalition agreement "Daring more progress" contains the goal of improving rainwater infiltration and reducing the risk of flooding with de-sealing projects. In some cases, de-sealing measures can restore natural soil functions, thus helping to secure important ecosystem services. Especially in dense urban areas with high pressure of use, soil functions can play a key role in climate adaptation.

Soil de-sealing helps to:

- → reduce heat stress and dry air
- → create green spaces and recreational areas
- → enhance the natural cooling function of soils, particularly in urban environments
- → increase water storage and retention capacity
- → restore ecological functions and carbon sequestration in soils
- → enhance biodiversity through the restoration of near-natural habitats.

Overall, targeted de-sealing measures improve the regional water balance and encourage the development of climate-resilient landscapes.

Moreover, de-sealing creates connecting corridors in the biotope network, enabling species to interact and resettle habitats. De-sealing not only promotes networks within settlements, but also improves connectivity for landscape hydrology and biodiversity conservation and secures high-quality soils.

Achieving the qualitative improvement of natural soil functions and its associated contribution to climate adaptation through de-sealing and renaturation measures poses a considerable challenge in the context of infill development (for example new development on empty sites, redensification measures, etc.) sought by policymakers. When deciding whether to de-seal surfaces and/or whether and how to rebuild, competition over land use in the region plays a crucial role. When it comes to land recycling, requirements for the reduction of (new) land sealing must be more firmly integrated. For new buildings this can be achieved, for example, by functional de-sealing with permeable surfaces (see also Measure 2.2) for sustainable rainwater management, or partial de-sealing with high-quality renaturation. Provisions under regulatory and planning law, information and advisory services for municipalities, as well as specific targeted funding options will play an important role in the promotion of de-sealing projects.

What the German government plans:

- Further develop legal instruments: shaping the de-sealing provision in the Federal Soil Protection Act (BBodSchG); reviewing scope for broader possibilities to mandate and enforce de-sealing measures in the Federal Building Code (BauGB); reviewing and giving greater consideration to de-sealing measures in new sealing activities.
- Launch an exchange process between *Länder*, cities and municipalities to agree on uniform identification and monitoring of de-sealing potential. IT-based solutions to efficiently identify and subsequently implement soil de-sealing potential will be devised, ideally using existing structures or structures already in development.
- Establish the online platform www.aktion-fläche.de as an information portal to present and network practical examples of soil de-sealing.
- Promote advisory services on concrete implementation of de-sealing measures, ideally through existing structures or structures already in development.

7 Nature-based climate action in settlement and transport areas

Green spaces in cities and towns are important recreational areas. In parks, urban forests, green belts and greened streets the services of plants for the urban climate can be felt: they improve air quality by removing pollutants and CO_2, give shade on hot summer days and provide additional cooling through transpiration. Interconnected green spaces act as cooling and fresh air channels. This urban nature offers habitat and refuge for many animal and plant species. Existing tree populations are particularly important in this context, for both nature conservation and climate. It is crucial that we preserve and support this nature on our doorstep and disseminate knowledge about it among experts and urban communities. A particular focus is on creating near-natural green spaces in heavily sealed neighbourhoods. The Federal Programme for Adaptation of Urban Spaces to Climate Change and the programmes under the Federation-*Länder* urban development assistance support towns and municipalities in adapting to climate change through the conservation, further development and upgrading of green-blue infrastructure, either as a project or in a specific area.

Beyond our settlements are far larger ecosystems. However, most of these are dissected by linear infrastructures like roads or railway lines, and the towns and villages on their margins encroach on them more and more. We want to counteract this increasing dissection and fragmentation of our landscape. We will reduce interventions in nature and landscape with a view to, for example, reducing land take for human settlements and transport to under 30 hectares per day by 2030. Unavoidable interventions will be compensated appropriately, including in terms of climate change mitigation. We want to improve connectivity of already fragmented habitats and restore ecological permeability (for example with green bridges). This strengthens ecosystem performance and thus supports nature-based climate action.

7.1 Supporting municipalities in the transition to green space management

Municipalities play a key role in achieving our climate targets. They have a large number of green and open spaces that can contribute to climate change mitigation and adaptation. An environmentally friendly design and management of these spaces is very important for these functions. Suitably designed, managed and connected spaces and green structures perform a wide range of ecosystem services, in particular for recreation, health and biodiversity.

Funding under the Federal Action Plan on Nature-based Solutions for Climate and Biodiversity will support municipalities in the transition to near-natural green space management. This will cover the costs of a range of actions, including setting up a tailored management plan, procuring the necessary equipment (such as for maintenance), training staff, establishing new near-natural green spaces or upgrading existing sites and mobilising citizen participation (for instance wildflower adoptions).

What the German government plans:

Within the framework of the Federation's constitutional competence, as of 2023 we plan to support municipalities in their transition to near-natural green space management by upgrading or establishing near-natural green spaces and encouraging networking among participating municipalities.

7.2 Planting additional urban trees

Trees are highly effective in removing carbon dioxide from the atmosphere, improving the local climate and promoting biodiversity. They are also of great benefit for recreation and quality of life in towns and cities. The overall impact of trees is greatly influenced by how the green spaces are designed and managed. A healthy, long-lived stand of trees is a prerequisite for high carbon sequestration and storage.

In order to specifically harness the diverse services of trees in human settlements, we will develop another funding programme dedicated to planting urban trees. The aim is to sequester carbon naturally and create strong synergies with biodiversity conservation and climate change adaptation. The new plantings will focus mainly on town and city centres and will include construction measures to optimise conditions at the site. To maximise the benefit for nature-based climate action and for biodiversity, quality of life and climate change adaptation in urban areas, tree species must be selected that are suitable for the location, climate-resilient, unlikely to trigger allergies and foster a high degree of biodiversity. We will furthermore support site improvements for existing trees and the development of street tree and urban tree plans. These will include the launch and continuation of "adopt-a-tree" campaigns.

What the German government plans:

We will support municipalities in developing street tree and urban tree plans and planting at least 150,000 additional trees by 2030; we will assist in site optimisation for existing trees. The measure will be designed as a useful supplement to the support models already in place under the Federal Programme for Adaptation of Urban Spaces to Climate Change and the programmes of the Federation-*Länder* urban development assistance.

7.3 Creating natural oases

Even small green spaces have been shown to improve the local climate in densely built settlements that are prone to overheating. They help increase diversity of species and biotopes, sequester carbon and allow people to experience nature. Nature experience areas, urban forest gardens and urban forests, mini-parks and a near-natural design not only have positive effects for nature-based climate action, but also offer spaces in the immediate living environment for exercise, recreation, social interaction and for children in particular to thrive both physically and mentally.

What the German government plans:

We intend to support municipalities in setting up natural oases (small green spaces) such as nature experience areas, urban forests, forest gardens, mini-parks and small near-natural water bodies.

7.4 Developing and implementing a model for the water-smart city

The water-smart city model will be refined for practical implementation. The aim is to strengthen sustainable precipitation management in cities (infiltration, evaporation, storage, heavy rain management, legal regulation of precipitation management) and to harness potential for adapting to drought and heat in towns and cities. Examples of the latter include prioritising (for instance in municipal drainage plans, flood prevention and reduction of heat stress) decentralised precipitation management in newly developed residential and commercial areas over discharge into the sewage system, with a special focus on heavy rain events. Water ecology and opportunities for people to experience their natural surroundings will also be integrated. This will include further clarifying technical approaches, social acceptance and possible risks to the environment and health and drawing up model recommendations. The various areas such as municipal land management, building and water law, financing and liability issues and existing technical rules need to be reviewed, for example using detailed research to identify adaptation needs. In addition, through programmes such as the Federal Programme for Adaptation of Urban Spaces, urban development assistance and the KfW programme for improving energy performance in cities, the Federation supports municipalities pursuing water-sensitive urban development, measures to prevent and manage heavy rain events and adaptation to climate change.

What the German government plans:

In the framework of the Federation's areas of competence under budgetary law we will:

- Support investments in revitalising urban water bodies to strengthen the near-natural water balance.
- Support implementation of measures for near-natural rain water management.
- Support water-sensitive urban development and the restoration of near-natural water balance; support consultation for municipalities, preferably using existing or planned structures, on managing precipitation and municipal water bodies.
- Review and adapt legal frameworks and advance technical planning for measures on water-sensitive urban development.

The measures will be designed as useful supplements to existing support options in the Federal Programme Adaptation of Urban Spaces to Climate Change and the Federation-*Länder* urban development assistance programmes.

7.5 Activating federally owned properties for urban green infrastructure and preparing pilot projects

As possible sites for urban green infrastructure and sustainable urban development, federally owned properties in urban centres such as railway lines, federal roads, federal waterways etc. hold great potential for nature-based climate action, biodiversity conservation, adaptation to climate change and for recreation. Research under this measure will examine how Nature-based Solutions can be implemented on federal properties in city centres, demonstrating this with model examples. As an essential component of liveable and future-proof cities, urban green infrastructure is vital in this context. Besides its importance for nature-based climate action, urban green infrastructure also supports biodiversity conservation, adaptation to climate change, provides space for recreation, exercise and social interaction and promotes health, environmental justice and urban nature.

The BMUV will invite relevant ministries to a joint dialogue on how federally owned properties can be integrated more effectively into urban green infrastructure networks and used for nature-based climate action. We will assess the potential of urban federal properties for NbS and identify the federal land available in selected cities. Feasibility studies for activating urban green infrastructure will also be carried out. To this end, talks will be held between stakeholders from the Federation, *Länder*, participating municipalities and other local actors, and concrete strategies prepared.

We will cooperate with partners to activate federally owned properties and draw up proposals for jointly promoting urban green infrastructure on federal and other publicly owned properties, and for accompanying research. This can also advance implementation of the strategy for considering biodiversity concerns on federal properties *(Strategie zur vorbildlichen Berücksichtigung von Biodiversitätsbelangen, StrÖff)* and strengthen synergies with biodiversity conservation.

What the German government plans:

At federal level, we will analyse positive examples of opportunities and obstacles to the use and further development of federally owned properties for urban green infrastructure, estimate the available land and potential for nature-based climate action in built-up areas and present recommendations for effectively activating federally owned properties for green and blue infrastructure serving a variety of functions.

At local level, we want to identify potential areas available and formulate concrete, site-specific strategies to make greater use of federally owned properties for urban green infrastructure and NbS. At the same time, we will advance dialogue and cooperation between the ministries on the role model function of government properties for nature-based climate action in settlement and transport areas.

7.6 Digital technologies and Nature-based Solutions in municipalities

Digital technologies hold great potential for data collection, monitoring, modelling and identifying concrete action areas and options for Nature-based Solutions in cities and municipalities. Artificial intelligence methods can, for instance, assist in early identification of urban trees especially affected by drought and help optimise watering systems.

However, the beneficial use of digital technologies hinges on numerous conditions being met. These include a high-performance digital infrastructure, the requisite data basis and the availability of qualified personnel. Municipalities often find it difficult to meet these requirements. There are, however, significant opportunities to leverage economies of scale for the implementation of digital technologies. Once developed, analysis and modelling methodologies and digital infrastructure could be made available to different municipalities, thus reducing the cost and workload of implementing individual applications.

The measure aims to provide suitable support services in line with the needs of cities and municipalities. These will build on existing support initiatives, services and tools and be attached to suprare-gional centres of competence and support structures like the regional agencies for nature-based climate action.

What the German government plans:

In the framework of the Federation's areas of competence under budgetary law, we intend to analyse potential and support needs for the use of digital technologies for NbS in cities and municipalities. Based on this, the development and implementation of concrete support aimed at advising and assisting different stakeholders in the implementation of digital technologies will be examined.

7.7 Advising municipalities on considering nature-based climate action in urban land use planning

Urban land use planning is an important tool for applying Nature-based Solutions at scale. It can lay down requirements to preserve open spaces relevant for nature-based climate action (such as cropland, pastures, forested areas), to minimise land use in building projects and to ensure that there are sufficient green and open spaces in populated areas as well.

Land-use changes are relevant for the climate. Especially when associated with construction work, they generally constitute an intervention in existing ecosystems and impact the terrestrial carbon cycle because they disturb the natural carbon reservoirs soil and vegetation.

Under this measure, municipalities will be advised on implementing strategies for nature-based climate action in their urban land use planning. The measure specifically envisages consultation services to support municipal development plans. This will build on the lessons learned from the now concluded support for climate-friendly land management strategies under the National Climate Initiative. The services must be considered in the context of support for municipalities under the BMUV Immediate Action Programme for Climate Adaptation and the funding measures under the guideline on promoting climate action in municipalities (Local Authorities Guideline).

What the German government plans:

- By the end of 2023, we plan to determine the consultation needs of municipalities with regard to implementing NbS as part of urban land use planning and identify a suitable, preferably existing or planned body as the executing agency for the measure.
- By the start of 2024, a guide on considering NbS in urban land use planning will be made available to municipalities.
- By around mid-2024, if deemed a necessary supplement to the guide, a consultation strategy will be developed (in cooperation with the executing agency) and pilot consultation schemes launched in representative municipalities in line with the funding available.

7.8 Package of measures for minimising land use – formulating target agreements

In its National Sustainable Development Strategy, the German government sets the goal of reducing land use for settlement and transport infrastructure from today's figure of around 55 hectares a day to under 30 hectares per day by 2030. This path is aimed at achieving net-zero land use by 2050 in line with circular flow land-use management. Reducing land use is a core component of sustainable development and avoiding land use is playing an increasingly important role in nature-based climate action and adaptation to climate change. It is also important for conserving near-natural farmland and managed forests.

The coalition agreement for the current 20th legislative period envisages underpinning the land use goal of the National Sustainability Strategy with concrete measures. We will scrutinise both planning law and financial and support policy instruments to determine their effectiveness for space-saving planning and building. Measures will be proposed for further developing these instruments or improving their use. This will build on the ongoing R&D project "Federation-*Länder* Dialogue on space-saving". It will also be closely coordinated with the EU Soil Strategy, the climate adaptation strategy, the German government's National Biodiversity Strategy and the revised Federal Soil Protection Act.

What the German government plans:

- Development of components for target agreements for reducing land use as part of the R&D project "Federation-*Länder* Dialogue on space-saving".
- Coordination in the German government of the package of measures for minimising land use.
- Implementation of measures: review and refinement of legal instruments; further development of support and funding options.
- Maintenance of the knowledge and communication portal www.aktion-flaeche.de

7.9 Strengthening the Federal Defragmentation Programme by building further wildlife crossing aids

The fragmentation of landscape and habitats by the transport network (road, rail) and increasing traffic density have led to habitat isolation and a decline in the quality of fauna and flora habitats that are still intact. Exchange within and between populations, colonisation of new habitats and important vector functions of animals are impaired or no longer occur to an adequate extent.

To implement the German and EU biodiversity strategies and the German Sustainable Development Strategy, existing fragmentations must be reversed and measures put in place to prevent new ones. The goal is to restore ecological permeability for all habitats and species affected by fragmentation.

To reduce the impact of fragmentation caused by federal trunk roads, the Federal Defragmentation Programme was adopted by the Federal Cabinet in 2012. It defines 93 priority segments on federal trunk roads where defragmentation measures are to be implemented by the *Länder* (delegated administrative powers) and, since 2021, also by the federal company Autobahn GmbH. Some measures will be implemented jointly with Deutsche Bahn AG.

As a contribution to climate action, model projects are to keep their carbon footprint as small as possible. This will be achieved by using, as far as possible, renewable raw materials in building structures. A particular focus will be on so-called grey energy and the capacity for long-term carbon storage.

What the German government plans:

- We will strengthen implementation of the Federal Defragmentation Programme by funding construction of further wildlife crossing aids. The goal is to complete ten such projects by 2026.
- We will update the Federal Defragmentation Programme to take into account the fragmentation effects of federal trunk roads and railway lines.

7.10 Strengthening habitat connectivity with crossing aids in federal transport infrastructure

In the National Biodiversity Strategy, the German government committed to restoring ecological permeability of fragmented spaces. The *Länder* are responsible for creating the Natura 2000 network and promoting the transboundary biotope network. The nationally important habitat connectivity axes are a particular focus. To effectively incorporate crossing aids for biotope connectivity into the infrastructure network, they need to be designed in a nature-friendly way and connected to the surrounding landscape. Spatial planning in the corridors must be guided. Key aspects are

→ incorporation into existing habitat connectivity and species protection strategies of the *Länder*

→ integration into municipal landscape planning

→ involvement of local land users in environmental design

→ cooperation with nature conservation and user associations.

Responsibility for habitat connectivity and hinterland connection lies with the *Länder* and municipalities.

What the German government plans:

The Federation will support pilot projects for developing model solutions. We will use these as a basis for drawing up plans for their practical application at other sites.

7.11 Funding for solar green roofs

Using rooftops for renewable energy generation, climate change adaptation and biodiversity conservation can make a multi-functional contribution to nature-based climate action that can be implemented quickly and has immediate effect. Solar green roofs are an element of green infrastructure that can improve quality of life in towns and cities and strengthen resilience to extreme weather events.

The flat roofs of existing buildings in particular have considerable unused space but even in new buildings, less than ten percent of roof area is designed to be multi-functional. Further potential can be harnessed in federally owned properties.

Market analyses show that the added expense of construction and higher maintenance costs are among the main obstacles to solar green roofs. Another factor is the special expertise needed for planning and execution.

The German government intends to improve incentives for the construction of solar green roofs and support innovations for multi-functional rooftops. To this end, the government will also support environmentally effective green roofs in existing buildings if they are installed in combination with solar power modules. Similarly, in new buildings, support will be provided for innovative roof greening systems with outstanding benefits for climate action, climate adaptation and biodiversity. The German government will also lead by example in federally owned properties by implementing model projects.

What the German government plans:

We will support the additional costs arising from establishing a near-natural greened roof combined with photovoltaic or solar thermal systems. In a two-pronged approach, funding will be provided for model projects to establish photovoltaic or solar thermal systems on roofs in combination with greenery and for solar green roofs in new buildings.

We plan to open the first funding window for the period 2023 to 2026 in the fourth quarter of 2023. The support will subsequently be further developed. Following the start-up phase from 2023 to 2025, experience gained will be evaluated and recommendations made for a second funding window from 2027. This measure is aimed at state, municipal and private property developers, companies and associations.

7.12 Funding guideline on Nature-based Solutions with a focus on rural municipalities

Many rural regions are marked by agricultural and forestry use. Their specific features and functions mean they are especially affected, both directly and indirectly, by the impacts of the climate crisis.

The availability of land in rural municipalities means they have great potential for greenhouse gas reduction and/or sequestration, for biodiversity conservation and strengthening ecosystem resilience. A special funding programme on Nature-based Solutions in rural municipalities will seek out municipally owned land in rural areas for implementing NbS.

What the German government plans:

In 2023, we will publish a funding guideline. Project support will strengthen nature-based climate action and the resilience of natural rural ecosystems. We will foster synergies between combatting climate change, conserving or enhancing biodiversity, making rural areas more attractive and taking precautionary action against the impacts of climate change. The funding guideline sets out priorities and establishes the selection procedure for projects. To prevent duplication of support, a clear distinction will be drawn between this programme and the responsibilities of the *Länder*, as well as existing support instruments such as the GAK and the Federal Programme for Adaptation of Urban Spaces to Climate Change.

7.13 Supporting nature-based climate action in businesses under the KfW Environmental Protection Programme

Settled areas, including business premises, often have a high degree of sealing and soil compaction. In many places, increasingly pronounced climate change has caused precipitation in summer to decline and led to heat waves and heavy rainfall events. These have considerable adverse impacts on nature, green spaces, the water balance, people and infrastructure. Such effects can be countered by renaturing or creating near-natural areas, in conjunction with decentralised precipitation management and efficient use of water. This benefits nature, people, the climate, water availability and natural soil functions.

Companies and industrial parks often have large outside premises that present an opportunity to gain new land for Nature-based Solutions by de-sealing, renaturation and the creation of near-natural biotopes. The grey infrastructure of businesses, such as roofs, car parks and facades, offer further major potential for green spaces to support nature-based climate action.

What the German government plans:

By extending the KfW Environmental Protection Programme, we will create incentives for companies to implement NbS. The aim is to encourage and support investments in the conservation, renaturation and restoration of natural and near-natural ecosystems. Funding will also promote measures to de-seal and renature soils and for natural, decentralised precipitation management.

8 Data collection, monitoring, modelling and reporting

To pursue nature-based climate action effectively, we need to systematically record the status and development of our ecosystems. Only this will enable us to recognise trends quickly and counter them where necessary. Emissions reporting in the LULUCF sector is only as accurate as the available data for ecosystems in this sector. To enable the effects of mitigation measures to be reflected in the national greenhouse gas inventory, monitoring data on implementation of the measures must be made available for climate reporting. We need to expand capacities in this area.

We will improve networking among the many institutions already gathering a range of data on ecosystems in Germany. This is important as often correlations only become apparent when observations from different fields are combined. We will also continue to harness data from new sources, for instance satellite remote sensing, and incorporate it into the existing structures. The goal is to leverage synergies between the various levels of monitoring currently in place and the institutions involved in order to ensure that work and structures are not duplicated but can be supplemented as appropriate.

The expanded data basis will be used to adapt and improve the tools for ecosystem modelling. A more robust characterisation of the current conditions will allow more reliable projections of future ecosystem developments, also with a view to the goals of the Federal Climate Change Act.

8.1 Improving accuracy and usefulness of emissions data and projections for reporting – enacting an ordinance in accordance with section 3a of the Federal Climate Change Act

The new section 3a of the amended Federal Climate Change Act lays down the first concrete targets for net emissions in the LULUCF sector. Emissions from drained peatlands and CO_2 removals in forests (negative emissions) are examples of CO_2 emissions that are counted towards LULUCF. However, these are considerably more difficult to determine than emissions in other sectors covered by the Federal Climate Change Act, such as gas or coal-fired power plants. This results in uncertainties in the calculation of emissions.

In light of this, reporting on Nature-based Solutions will be improved by increasingly supplementing and validating the approaches used to date – which are based on emission factors and activity data – with current measurements of greenhouse gas streams and concentrations. This must include examining to what extent marine ecosystems can also be considered. Links between the data sources currently used will be strengthened, especially with regard to the LULUCF emissions balance, and additional data sources will be integrated, in particular from satellite remote sensing. To ensure the additionality of LULUCF measures and preclude double counting, digital systems will be used to improve reporting accuracy and, where suitable, to support progress assessment of the various measures.

Alongside harnessing the capacity of ecosystems to sequester CO_2 from the atmosphere and store it for the long term, a second pillar of nature-based climate action is the capacity of landscapes to retain water and provide cooling. It is possible to monitor this across the country using satellite thermal data.

The Federal Climate Change Act contains the option of laying down rules for the calculation and accounting of CO_2 emissions and removals in the LULUCF sector in an ordinance. This must take the relevant provisions at European and international level into account. The German government will enact a corresponding ordinance as soon as possible in order to improve the planning bases for the LULUCF sector.

What the German government plans:

By the end of 2024, we will submit a ministry draft for the ordinance pursuant to section 3a of the Federal Climate Change Act. The basis for this will be the National Emissions Reporting System agreed by the state secretaries of the ministries concerned on 5 June 2007. The German Environment Agency (UBA) and the Thünen Institute will also be involved in the process as the parties responsible for reporting.

We will combine our experiences with satellite monitoring of landscape water retention capabilities and the associated indicator “surface temperature”. We will examine the validity and large-scale operational readiness of satellite thermal data for monitoring the functional quality of ecosystems. In this process, we will also include options for linking up with existing environmental monitoring systems and, where possible and practical, make the data available for the progress assessment of the Action Plan.

8.2 Reviewing intervals and form of the National Forest Inventory, expanding digitalisation of forest monitoring

The National Forest Inventory and the Carbon Inventory are carried out alternately every five years, gathering data on forests and their development. The intervals and form of the National Forest Inventory must be reviewed and where necessary adjusted in line with new requirements and new technical possibilities. Digitalisation of forest monitoring will be expanded as needed. This should include a review of new options for the use of remote sensing and artificial intelligence (AI) methods and, if useful, integrating them into the overall forest monitoring strategy.

What the German government plans:

We will review the intervals and form of the National Forest Inventory and establish a digital forest monitoring system.

8.3 Establishing a National Soil Monitoring Centre under lead responsibility of the German Environment Agency (UBA)

Soil is an asset to be protected. Robust and comparable data on long-term changes to soil quality and functions are needed to support climate adaptation measures. Soil quality surveys and soil monitoring programmes fall under different areas of responsibility and focus on selected technical issues. This has resulted in poor comparability of the data and often prevents general statements on soils being made that are applicable across different monitoring networks. However, in order to develop climate policies and monitor the success of adopted measures, the climate action programmes of the EU and the German government need comparable national data on soils. The decision to establish a National Soil Monitoring Centre was enshrined in the coalition agreement for the 20th legislative period.

What the German government plans:

Drawing on emissions reporting structures, we will establish a National Soil Monitoring Centre at the German Environment Agency (UBA), in close cooperation with the Thünen Institut and other data-gathering institutions, with the aim of collating the soil quality data collected in Germany and making this data as widely usable as possible.

To this end, we will bring together and network specialists from different fields active in soil-related monitoring and data gathering, with the aim of using data evaluation and modelling to produce joint, nationally harmonised, robust statements on soil status and changes. All institutions related to soil monitoring will be involved – from the Federation, *Länder*, science and research.

8.4 Further developing national biodiversity monitoring with the goal of determining the contribution of nature-based climate action to biodiversity conservation

This Action Plan is aimed at effectively promoting both climate change mitigation and biological diversity. It therefore covers a wide range of measures and topic areas. A sound scientific data foundation is needed to determine to what extent the desired effects for biodiversity conservation are achieved.

The national monitoring programmes currently in place or being set up for nature conservation, as well as other data collection in the fields of environment and land use, already provide scientific support for the Action Plan. This will be taken as a starting point for work with leading institutions to establish or build on monitoring programmes in the entire landscape. The results can be used to draw conclusions on trends in the size and quality of the habitats promoted by the Action Plan and to compile lists of representative or typical species.

Protected areas, wilderness, connected habitats and small-scale structures in agricultural landscapes will also play an important part. Based on existing activities, we will develop a system to monitor protected areas, wilderness and habitat connectivity. This system must be capable of describing changes in the size of habitats, their quality and typical species. To this end, programmes for monitoring characteristic species groups will be further expanded. Connecting factors and synergies with existing programmes and institutions in the field of biodiversity monitoring will be used. To help expand the data basis, citizen involvement in specialist and nature conservation associations will be promoted and training provided. The data basis will be analysed using scientific methodologies that enable the Action Plan's contribution to biodiversity conservation in Germany to be described.

What the German government plans:

By 2025, we will develop and gradually implement a plan for monitoring biodiversity in the context of the Action Plan, ensuring that duplication of work is avoided. In this way, we will provide the basis for identifying and quantifying the effects of the Action Plan on biodiversity conservation in Germany.

8.5 Monitoring the climate effects of measures for the ecological development of rivers, including waterways

Measures under the Blue Belt Programme along federal internal waterways and water management measures along all rivers enhance the condition of floodplains, improve connections between rivers and floodplains and increase the naturalness of riverbeds and banks. This leads to positive climate-relevant effects, for instance in the causal relationship between flooding area and flooding frequency. It promotes beneficial changes in land use and de-sealing, and positively impacts the soil and

groundwater balance, biodiversity and material turnover, including nutrient and carbon retention. A systematic classification using relevant parameters and models will allow a credible assessment of climate-related effects of measures implemented as part of ecological river development. We will also draw up a catalogue/list of measures that make a particularly effective contribution to nature-based climate action along rivers and federal waterways.

What the German government plans:

- We will draw up a monitoring strategy for assessing how effectively measures for ecological river development contribute to nature-based climate action and determine the actual status, target status and trends.
- We will develop and apply projection models.
- We will establish long-term monitoring and progress assessment using measurable indicators which all ministries can use to achieve comparability, irrespective of the grounds for implementing the measure.

8.6 Improving forecast capabilities of water balance analyses

The status of the water balance is decisive for the functioning of ecosystems and their natural processes. Precipitation, in-flow and run-off, infiltration, evaporation and changes in storage are the underlying components of the water balance. To understand the impacts of ground and surface waters and their ecosystems, we need a nationwide exchange.

The competent higher federal authorities will present and implement a joint work programme for the development of a shared integrated range of publicly accessible data and services. The goal is to cooperate with the *Länder* to develop comprehensive, large-scale forecasts of the available water resources. This will enable regional and supraregional analyses and allow suitable measures to be formulated for securing a near-natural, regional water balance that takes the water needs of the ecosystem into account. The forecasts will serve as the basis for assessing individual projects and subsequently monitoring their effects and progress. This will include nationwide water balance modelling (also a hydrogeological model), tied in with climate models as a basis for analysing medium- to long-term water resources and water needs in all regions of Germany. This work programme will be supplemented and supported by suitable funding measures of the Federal Ministry of Education and Research (BMBF).

What the German government plans:

- Monitoring: establish measuring stations throughout the country.
- Further develop digital data transmission systems.
- Draw up near-natural water use strategies.
- Share water balance models between the *Länder*.
- Upgrade existing water balance models that cover an entire river basin or several *Länder*.
- Provide data bases on the impacts of changes in climate and agricultural practices on the regional water balance as a consistent planning basis for the Action Plan.
- Cross-media implementation of near-natural water balance in legal provisions.

8.7 Determining land requirements for water body development corridors

If watercourses and floodplains are given the space to develop, they will again be able to perform numerous functions and ecosystem services such as carbon sequestration and build long-term resilience to the impacts of climate change.

When determining the land requirement for floodplain development and water body development corridors, sustainable water resource management and the needs of nature conservation and the water industry must be taken into account. The improvements in ecosystem services associated with the additional space for rivers and floodplains and the impacts on current and future uses will be outlined. Regional planning authorities will be informed of the findings, in particular the necessary size of the corridors along the watercourses, so that these can be laid down in the planning process. In this way, sites can be secured under spatial planning procedure for future water body development. In addition, spatial planning and water management planning must be better coordinated.

This approach will first be examined more closely in simulations and pilot projects. In addition, the scientific foundations still to be developed for determining the land requirements will provide the basis for discussing the opportunities and synergies arising from laying down a land use target in environmental policy for the development of watercourses and floodplains.

What the German government plans:

- Determine the land requirement for water body development based on expert assessments.
- Analyse the effects of water body development on ecosystem services.
- Estimate how far water body development might be a preferred option and the extent to which conflicts of interest, for example due to multiple uses, can be resolved.
- Analyse the effect of the quantified area for water body development on the regional water balance, the resilience and biodiversity of water body and floodplain ecosystems and on net greenhouse gas emissions.
- Communicate the land requirement (to *Länder*, ministries, stakeholders).
- Develop, communicate and implement the necessary steps to optimise the legal framework so that spatial allocation for water body development can be integrated into regional planning provisions. This measure will include simulations and pilot projects.
- Estimate the challenges and opportunities for environmental policy to be expected from establishing a land use target for water body development.

8.8 Targeted support for research on monitoring and modelling terrestrial and marine ecosystems and harnessing AI

A good data basis is a prerequisite for improving the status of our ecosystems and conserving biodiversity as the climate crisis progresses. Often, however, there is a lack of state-of-the-art equipment, data in the necessary quality and quantity and statistical-mathematical processes for identifying correlations in the data and using them for projections.

To expand the biotic and abiotic data basis, we especially need to tap existing data sources that have not yet been used for ecosystem monitoring, and collect new data. Integrating new data into existing systems must be simplified and data processing automated. Data from different sources must be harmonised and put to optimal use. Moreover, new methodologies can be developed, for instance using the modern systems referred to above, to collect new data on parameters not previously considered. However, the most important aspect is to develop, using a data basis that covers the relevant parameters, models that precisely describe the behaviour of ecosystems, thus enabling projections to be made on their future development. Data bases must be user-friendly and accessible.

Artificial intelligence (AI) can play a role in this. For example, smart sensors allow data to be collected more efficiently, automatically categorised and evaluated in real time. AI systems help recognise patterns in large data sets, thus facilitating modelling – especially in those fields which stretch the limits of conventional modelling methods.

To leverage this potential and make it visible and usable on a large scale, ambitious, application-oriented research and development projects must be funded. The initiative AI lighthouse projects for the environment, climate, nature and resources is one such tool for supporting high-visibility environmental AI projects.

What the German government plans:

We will initiate research into new approaches for monitoring, for example, carbon stocks in soil or marine habitats, to ensure their continued function in the ongoing climate crisis. For the collection of new data we will also use modern, automated processes that can quickly generate high-resolution data.

In a new programming cycle of the AI lighthouse projects initiative, financed from Climate and Transformation Fund resources earmarked for nature-based climate action, we will support up to 15 projects, which will include use of new techniques and AI-based monitoring, modelling and projection methodologies to capture the changing state of ecosystems more accurately and generate new findings and applications for forward-looking nature conservation and climate policies.

8.9 Tapping remote sensing potential for Nature-based Solutions

With new technology and evaluation procedures, remote sensing offers considerable potential that can be harnessed for improving the data on ecosystem status and changes and on projections for the future development of our ecosystems. Robust use of Earth observation data (for example of the European Copernicus programme, various information-gathering aerial vehicles and devices, terrestrial survey and sensor networks) can significantly streamline and optimise environmental and nature conservation monitoring at the different administrative levels (Federation, *Länder*, municipalities). A basic, cross-cutting task is to consolidate and coordinate ready-to-use data sets in the field of nature-based climate action.

Besides quality-assured data access and the development of better data products, this requires coordination among the responsible institutions. Pilot applications must be translated into operational structures and processes. Services for accessing data products must be developed with concrete objectives for nature-based climate action in mind. Only this will enable environmental protection and nature conservation authorities throughout the country to make long-term use of Earth observation data and develop policy recommendations for NbS.

Operationalising satellite services is already well established in atmospheric, climate, land cover and agricultural monitoring. For example, remote sensing data improve harvest forecasts, weather analyses and the quality of forecasts. In recent years, remote sensing has also been used for situation assessment and planning in the context of civil protection (such as ad-hoc overview of situation if a disaster occurs) and to some extent is now embedded in authority structures. It is also used for monitoring land cover with small-scale surveys of buildings and vegetation (including open space, urban green, sealing and heat). Nevertheless, the potential of remote sensing is far from exhausted (for example, highest resolution satellites with multi- and/or hyperspectral radar data can detect minute changes and record environmental conditions). This rapidly evolving remote sensing technology and the potential it holds will be used more intensively for environmental and nature conservation monitoring.

Additional expertise and resources are needed to implement this, but are currently not available to environmental and nature conservation authorities to the extent necessary. Available scientific findings and experience gathered by other authorities in similar cases will be drawn on to set up and coordinate suitable remote sensing services for nature-based climate action. The goal is to develop modular services and processes for accessing data products, making them operational and ultimately transferring to the ministry the necessary resources for maintaining the procedures.

What the German government plans:

Together with partners from science and industry, we will transfer scientific findings from remote sensing to a tool box for efficient operational monitoring of the environment by authorities, thus significantly advancing implementation of NbS. This will be done within the time frame and financial scope of the funding available from the Climate and Transformation Fund for nature-based climate action. The resulting improved data basis will also be made available for greenhouse gas reporting.

8.10 Monitoring and map-based presentation of implementation of Action Plan measures

The Action Plan is a broad programme with a wide variety of measures. While a large number of these are funding measures, they can vary greatly both with regard to the object of support, the target group and the conditions attached to the funding. This makes it all the more important to monitor implementation of each measure using measurable indicators and targets that allow comparability. That is the prerequisite for a robust assessment of overall progress on the Action Plan and serves as the basis for identifying at an early stage areas where the Action Plan needs correcting.

We also want to make progress on the Action Plan publicly visible and understandable for everyone. Map-based presentations help to locate where progress has been made. The Federal Agency for Nature Conservation already has a wealth of experience with online interactive maps, for instance to show the extent of protected areas or the range of endangered species. We will use this experience for the Action Plan.

What the German government plans:

We will set up comprehensive monitoring to gather data in a centralised system on progress made in the implementation of the different support measures of the Action Plan. We will make the main indicators publicly available via an interactive, map-based online tool. Monitoring data will be made available for greenhouse gas reporting and for progress assessments for the various measures.

Research and capacity building 9

Ecosystems are comprised of diverse interdependencies that can be very complex. Climatic conditions, landscape form, type and methods of human use, nutrient supply and many other factors influence the occurrence of animal and plant species and other (micro)organisms. These in turn impact living conditions in and around the respective ecosystem. However, the accelerated climate crisis and unsustainable uses are affecting the balance of our ecosystems, forcing them to adapt quickly to new conditions. We need in-depth research on these interactions in our changing ecosystems. The better we understand the interdependencies, the more precisely we can tailor the options for nature-based climate action.

We are already familiar with many measures which can effectively advance climate action and biodiversity conservation – this Federal Action Plan on Nature-based Solutions for Climate and Biodiversity is a testament to that. What is vital, however, is that this knowledge is available in the places where measures can be implemented. Stakeholders who own or manage suitable sites need support in planning and implementing NbS, and contact points which cover a broad spectrum of knowledge.

Moreover, there are other promising approaches for improving the climate change mitigation and biodiversity conservation functions of ecosystems used by humans. Clearly, further research must be carried out on these approaches before they are implemented on a larger scale.

9.1 In-depth research on nature-based climate action

In-depth research into the interdependencies and changes in and between different ecosystems is crucial for deriving options for effective, targeted and long-term Nature-based Solutions. In particular in view of the accelerating climate crisis and the associated climatic changes, we need to understand the current developments in our ecosystems and quickly develop NbS which can be implemented in cooperation with actors from civil society as soon as possible.

The German government already supports a range of research projects on NbS, especially under the Research for Sustainability strategy (FONA). In future, we will ensure that NbS issues are sufficiently addressed. In this way we will steadily add to our knowledge of nature-based climate action and expand corresponding research capacities. We need to develop the requisite expertise now so that science can keep abreast of developments in the coming years and decades.

To this end we have carried out a systematic stocktake of existing and planned research on NbS.

What the German government plans:

We will compare the results of the stocktake with the research needs. Calls for research will be issued in cases where these needs are not adequately covered.

9.2 Trilateral Wadden Sea research – the UNESCO World Heritage Site Wadden Sea and the challenges of climate change and biodiversity loss

The impacts of climate change, in particular the rise in sea levels and temperature, and the growing frequency of extreme weather events, will have a major effect on the Wadden Sea as a dynamic, diverse and highly productive ecosystem and on its socio-economic structures. Additional pressures arising from unsustainable uses and continued high inputs of nutrients and pollutants impair the Wadden Sea and its functions.

To improve projections on the future development of the Wadden Sea ecosystem and in light of existing pressures, more accurate data must be collected on climate-related changes. The impacts of these changes on the Wadden Sea coastal stability, ecosystems and ecosystem functions must be evaluated.

The planned research programme comprises interdisciplinary projects involving all relevant stakeholders and user groups of the Wadden Sea region. It builds on approaches and findings from ongoing coastal research activities funded by the Federal Ministry of Education and Research (BMBF).

Based on these results and on existing knowledge, recommendations for action and solutions are to be drawn up for the protection and long-term conservation of the UNESCO World Heritage Site Wadden Sea. These will focus in particular on the physical, biogeochemical and ecological processes and high productivity and biodiversity of this ecosystem, with the aim of improving and preserving its socio-economic functions (such as natural coastal protection) and ecosystem services (such as natural carbon sink) for the long term. To this end, specific proposals for the restoration of degraded Wadden Sea ecosystems are to be developed and pilot projects implemented where suitable.

What the German government plans:

This will be Germany's contribution to a trilateral, coordinated research programme aimed at creating the bases for permanently protecting the Outstanding Universal Value and integrity of the UNESCO World Heritage Site Wadden Sea.

9.3 Applied research on the potential of Nature-based Solutions for climate change adaptation

Nature-based Solutions (NbS) play a vital role in nature-based climate action. They are a key component in climate change mitigation and adaptation, in conserving and enhancing biodiversity and raising the resilience of society and ecosystems.

Possible research areas are the potential and limits of NbS (including in combination with technical solutions), with a focus on integrated solutions in natural spaces. Examples are flood prevention in low mountain ranges, groundwater recharge, water storage in agricultural landscapes, retention areas in watercourses and natural coastal protection. A specific field of research might be assessing the possibilities and limitations of NbS for climate-resilient, water-smart urban development (sponge city). Another possible topic is the capacity of farmland or local ecosystems to retain water in the landscape.

The applied research in this measure is aimed at turning the opportunities offered by NbS into practical options for action, especially in climate change adaptation, and where possible quantifying the co-benefits for (nature-based) climate action, biodiversity and climate change adaptation. Building on this, an assessment of the potential of NbS for shaping the nexus of climate adaptation, climate action and biodiversity will be carried out. Another component of this research will be to analyse and evaluate the potential for implementing NbS and develop proposals for tapping that potential.

The applied research will formulate criteria for identifying synergies between nature-based climate action, biodiversity conservation and adaptation to the climate crisis, highlight practical, participatory approaches for evaluating these synergies and determine success factors for their implementation.

What the German government plans:

We will quantify co-benefits in order to assess the potential of NbS for the nexus of nature-based climate action, climate change adaptation and biodiversity conservation and evaluate the effectiveness of measures (ex ante and ex post). Taking a holistic approach, we will propose design options for leveraging this potential.

9.4 Scientific support for projects, programmes and measures under the Federal Action Plan on Nature-based Solutions

The Action Plan will be underpinned with scientific support. The purpose is to review the effectiveness and efficiency of the Action Plan and its measures and to mobilise financing of applied scientific studies to fill knowledge gaps in the development and implementation of NbS projects, programmes and measures. The following clusters are planned:

- → overarching evaluations and studies on projects, programmes and measures under the Action Plan
- → scientific support for the duration of especially suitable and/or innovative projects and programmes
- → scientific support on interdisciplinary and transdisciplinary issues (for example, public perception and acceptance of the Action Plan and its projects, programmes and measures; analysis of interactions between climate action, biodiversity conservation and people; examining and assessing both specific and overarching impacts).

What the German government plans:

By mid-2023 we will establish scientific support for the Action Plan. From 2024, an evaluation of the scientific support is planned, to be carried out by the Scientific Advisory Board for nature-based climate action (see Measure 9.5).

9.5 Establishing the Scientific Advisory Board for Nature-based Solutions at the BMUV

Nature-based climate action is an important cross-cutting topic that brings together core competences. An independent, scientific and ideally practice-oriented perspective will help optimise planning to ensure it is as effective as possible. Connections and interactions between different measures of the Action Plan must be considered and the positive overall impact of the Action Plan must be ensured. This should also examine whether priorities need to be changed in the course of implementation.

To that end, work in the field of nature-based climate action needs the systematic support of interdisciplinary and transdisciplinary scientific expertise. We will therefore set up a permanent Scientific Advisory Board for nature-based climate action, composed of specialists from relevant disciplines whose expertise can directly inform work in the field of nature-based climate action.

What the German government plans:

In 2023, we intend to appoint a Scientific Advisory Board for nature-based climate action composed of specialists from relevant disciplines. It will be asked to provide expert assessments on issues related to nature-based climate action.

9.6 Establishing a national Centre of Competence and regional agencies for nature-based climate action

Nature-based climate action can only have broad success if local stakeholders are informed of the support options and can be enlisted to implement corresponding measures. In many cases, support will also be needed to develop joint projects of several stakeholders, coordinate measures with co-benefits, submit project applications and implement specific measures. Knowledge on the goals, opportunities and particular features of Nature-based Solutions and the various relevant disciplines involved needs to be generally improved to ensure a high standard of implementation. Alongside this, it is important to improve networking among actors and enhance local cooperation for NbS.

For the duration of the Action Plan funding programmes, a Centre of Competence for nature-based climate action will coordinate NbS advisory services for stakeholders and interested parties in the regions and serve as a nationwide contact point for questions relating to NbS. The Centre of Competence will develop a plan to establish *Länder*-based or regional agencies for nature-based climate action, which will support the work of the Centre of Competence. Existing structures should be used as far as possible. Any advice structures relating to NbS that are already offered by individual *Länder* and regions will be incorporated into the plan and where necessary supplemented in line with the new requirements. This will be coordinated with the *Länder*.

The regional agencies will support stakeholders for the duration of the Action Plan funding programmes, for instance in identifying, developing and proposing suitable NbS. Stakeholders may include land owners and managers, agricultural, forestry, horticulture and landscaping operations, churches, municipalities, clubs, associations (including river basin and land development associations, environmental and nature conservation organisations), administrative bodies and authorities (including in municipalities, protected area administrations).

To reach the stakeholders that are key for nature-based climate action, alongside the national Centre of Competence and the agencies at *Länder* and regional level, it is vital to establish a caretaker structure at the most local level possible. For instance, regional partnerships for stepping up NbS can be initiated between municipalities, associations, businesses and other interested parties.

Many local associations, organisations and institutions are already tackling issues relating to NbS. We need to enlist these for cooperation and give them support. These structures can be provided with the necessary financial resources for personnel and materials to implement the measures of the Action Plan. New structures can also be established in coordination with the *Länder*. Existing services to advise and inform on aspects of nature-based climate action will be linked up efficiently and duplicate structures avoided.

What the German government plans:

We first want to establish a national Centre of Competence for nature-based climate action that can act as a nationwide contact point for the duration of the Action Plan programmes, in particular for questions relating to support for NbS. We will work with the *Länder* to set up regional agencies for nature-based climate action.

9.7 Making measures under the German Adaptation Strategy (DAS) funding programme permanent, with a focus on nature-based climate action

The DAS funding programme of the German Adaptation Strategy was revised in 2021 and centres on supporting municipalities and municipal institutions in promptly implementing the necessary processes for climate change adaptation and transformation in an integrated, sustainable way. A major focus is on the use of synergies and positive side effects for the sustainability goals, especially in relation to climate change mitigation, biodiversity conservation and securing ecosystem services – and thus automatically contributes to nature-based climate action. The support is specifically aimed at establishing positions for adaptation managers in municipalities who have the task of drawing up and implementing sustainable climate change adaptation strategies with a focus on Nature-based Solutions. In addition, the funding also covers the realisation of an investment project selected from the sustainable climate change adaptation strategy.

The second support element of the DAS programme comprises a competition to develop outstanding, innovative climate change adaptation strategies which generate synergies with sustainability and which are trialled through an investment measure.

The Federal Action Plan on Nature-based Solutions for Climate and Biodiversity will gear certain measures under the DAS programme more specifically to nature-based climate action.

What the German government plans:

- Open a funding window to promote climate change adaptation managers. Broaden the role of climate change adaptation managers and expand the consultation and qualification services of the *Zentrum KlimaAnpassung* (climate adaptation centre), aligning its work more towards Nature-based Solutions.
- Support follow-on investment projects from the first programming cycle 2021/22, dedicated solely to NbS.
- Open the first funding window for innovative model projects, directing it at projects dealing solely with nature-based climate action and the use of NbS.

9.8 Advancing nature-based climate action through landscape planning

A range of ecosystems, for example forests, floodplains, peatlands and different urban green spaces, have the potential to make a significant contribution to nature-based climate action. Alongside the active management of their use, these sites need to be protected with planning instruments. Landscape planning pursuant to sections 8 ff of the Federal Nature Conservation Act (BNatSchG) can serve as a model for relevant measures by identifying suitable areas, quantifying their potential services and integrating safeguards in overall spatial scheduling and urban land use planning.

Landscape structure planning is key here. It specifies provisions of the landscape programme, while also fulfilling essential service functions for municipal landscape planning, such as preparing regional climate scenarios, compiling information on abiotic environmental media (for example carbon-rich soils) and land uses, or by drafting regional sensitivity and vulnerability analyses. Landscape planning procedures must also fulfil their legal mandate by internally addressing and resolving conflicting goals. Synergies or conflicts with other disciplines or planning levels can also be identified at the level of the landscape master plan, allowing synergies to be exploited and conflicts averted.

Consequently, municipal landscape plans must include the specification and fleshing out of points relating to climate change adaptation. The goals and measures specified in this way for adaptation to climate change must therefore be considered in the weighing process pursuant to section 1 (7) of the Federal Building Code and can be included in urban land use plans as presentations or designations pursuant to sections 5 and 9 of the Federal Building Code.

What the German government plans:

In model projects we intend to test - for planning regions (landscape master plan) and municipalities (landscape plan; green space structure plan) - how the respective levels of landscape planning help identify and legally protect sites and ecosystems for nature-based climate action and will develop transferable guidelines for action and work aids.

9.9 Promoting education for nature-based climate action

We support the development of a comprehensive spiral curriculum on the Action Plan on Nature-based Solutions for Climate and Biodiversity which will address the different topics in all stages of education (early childhood education, school and extracurricular education, professional training and life-long learning). In order to reach as many target groups as possible, we will provide various primarily digital formats with the aim of mobilising people for nature-based climate action. Alongside schools and other educational establishments, we will work in all kinds of learning spaces, including libraries and adult education centres.

We are making educational materials and services available in digital form, to promote the development of a dedicated digital learning space for the Action Plan. All educational materials on the Action Plan can be brought together in this digital learning space and tailored to suit the target group. The digital learning space is embedded in the National Digital Education Platform. In close cooperation with science and youth associations, we support the development of quality criteria and their formative evaluation for good quality digital educational materials and services on the Action Plan.

Based on the educational tools devised, we will support the development and implementation of further education modules on the Action Plan and the digital learning space. This will reach at least 1,000 teaching professionals.

Professional training is a priority for us and we are funding a study to identify occupational profiles relevant for the Action Plan. We want to support the development and launch of further training programmes on the Action Plan for these jobs and professions.

What the German government plans:

We will prepare and widely disseminate Action Plan topics for formal and non-formal education across the entire education chain. To this end, we will establish a digital learning space for the Action Plan so that interesting and up-to-date content can be accessed by the various target groups, regardless of time and place. We will develop further training courses for both teachers and their trainers. These measures will be implemented in line with the National Action Plan on Education for Sustainable Development.

9.10 Mobilising private capital for Nature-based Solutions for climate and biodiversity

Public budgets alone will not be able to cover the enormous funding requirement for Nature-based Solutions. For this reason, private finance needs to be brought on board. A particular challenge in this context is for NbS to be reflected in investment decisions as an ecosystem service and hence a non-market public good. In addition, nature-based climate action has to be approached from a global as well as a national point of view. That is why supply chains (for example verifying that they are deforestation free) are relevant for NbS and should be taken into account in investment decisions.

What the German government plans:

We will task the German government's Sustainable Finance Advisory Board with developing concrete options for mobilising private capital for the conservation of ecosystems and maintenance of their climate function, and take these into consideration in the implementation and further development of the German Sustainable Finance Strategy.

10 Cooperation in the EU and the international community

Nature-based climate action can only succeed in close cooperation at international and EU level. The German government will continue to promote nature-based climate action and advocate an ambitious approach in bilateral and multilateral international cooperation and all relevant EU processes.

Germany made strengthening NbS – and hence nature-based climate action – a cross-cutting topic for the climate and environment track of the G7 negotiations. At European level, many of the European Commission's legislative proposals and initiatives that are based on the Green Deal and especially the Fit for 55 package focus on nature-based climate action or NbS. These include the draft regulation on the Carbon Removal Certification Framework. In the coordination of this draft, we are striving to forge the strongest possible link to nature-based climate action. Our efforts at EU level are flanked with, for example, bilateral cooperation with EU member states. To this end, we are holding dialogues and implementing measures for experience exchange, awareness raising and capacity building.

The Action Plan will be a key tool for transposing the EU regulation on nature restoration, currently in draft form. This lays down EU-wide legally binding targets for ecosystem restoration and substantially contributes to implementing the Global Biodiversity Framework.

We will support NbS at international level too, continuing to play our part in implementing the Convention on Biological Diversity, the Paris Climate Agreement, the Convention to Combat Desertification, the UN Decade of Ecosystem Restoration, the UN 2030 Agenda and many other important regulations and initiatives relevant for nature-based climate action. In bilateral cooperation formats and in the German government‘s development work, NbS and hence nature-based climate action play an important role. In our feminist approach to foreign and development policy, we are placing particular focus on the role and knowledge of indigenous peoples and local communities (IPLCs), women and youth. To implement this, we will maintain and build on proven support structures and financing sources, such as the International Climate Initiative (IKI) and climate and development partnerships (P+).

10.1 Advancing ambitious design of Nature-based Solutions in all relevant EU processes

The cross-cutting topic of nature-based climate action is linked to a number of different processes at EU level. Many are part of the European Green Deal and its Fit for 55 package. They have the potential to take nature-based climate action in the EU a good step forward and generate additional funding. However, it is important to take a broader view and anchor NbS in many different fields. Relevant processes and projects include:

- Regulation on the inclusion of greenhouse gas emissions and removals from land use (LULUCF Regulation)
- EU regulation on nature restoration
- EU Biodiversity Strategy for 2030
- EU Forest Strategy
- EU Soil Strategy for 2030 and the announced EU Soil Health Law
- The draft regulation for a voluntary EU Carbon Removal Certification Framework
- Directive on Corporate Sustainability Reporting
- EU Water Framework Directive
- EU Adaptation Strategy
- EU Green Infrastructure Strategy
- Flora and Fauna Habitats and Birds Directives
- Marine Strategy Framework Directive
- Directive on Corporate Sustainability Due Diligence
- Regulation on Deforestation-free Supply Chains
- Destination Earth initiative
- EU Common Agricultural Policy (CAP)
- EU Common Fisheries Policy (CFP)
- EU taxonomy
- Renewable Energy Directive

What the German government plans:

We will continue to advance NbS in all EU processes, working to avoid duplications and exploit synergies in design and implementation. We will urge the European Commission and the Council in particular to take an ambitious approach. When negotiating regulations at EU level we will seek to ensure that they offer conditions most conducive to nature-based climate action.

10.2 Enshrining Nature-based Solutions in international climate partnerships and in other bilateral cooperation formats

Climate partnerships are becoming more important in the German government's international climate policy. These partnerships and other bilateral cooperation projects on climate and environmental topics will also incorporate Nature-based Solutions as a way of harnessing the synergies between nature conservation and climate action.

Strengthening biodiversity and climate action is a global undertaking which we can help tackle more quickly through international cooperation and the use of Nature-based Solutions. Throughout the world, changes in forests and soils caused by unsustainable use are a significant source of greenhouse gas emissions. Countries and regions with biodiversity hotspots (including tropical forests, peatlands, mangroves, freshwater ecosystems), dynamic industrialisation pathways and high climate vulnerability are particularly affected by degradation. Better protection, sustainable management and restoration of ecosystems and their climate function can therefore play an important role in achieving nature conservation and climate targets, advancing climate change adaptation, protecting against climate risks and disasters, making agriculture more climate-resilient and achieving the United Nations Sustainable Development Goals in general.

International partnerships in the fields of climate, development and environment will raise awareness of NbS in partner countries and develop joint pilot initiatives that take concerns of the local community into account. Besides drawing up agreements on specific measures for the conservation, restoration and sustainable use of ecosystems, in our climate partnerships and other joint activities we will agree on how to work together at global level for ambitious implementation of biodiversity and climate targets and how we can raise the necessary international financing. International cooperation aims to increase awareness among both policy-makers and civil society in the partner countries of the benefits and uses of NbS, offer consultation services and develop pilot initiatives in selected countries.

What the German government plans:

The German government will step up its efforts to anchor Nature-based Solutions for climate and biodiversity as a priority area for political cooperation in the framework of international collaboration. The German government will offer partner countries consultation services and work with them on joint pilot initiatives (nexus approaches to NbS and for strengthening local value creation).

10.3 Raising international financing for nature-based climate action and NbS, including through multilateral development banks

Considering Nature-based Solutions in climate policies and measures can play a key role in the conservation and restoration of biodiversity and in climate change mitigation in countries of the Global South. For this, we need to increase capacity building and broaden the implementation of such measures, both of which will require additional funding. Alongside bilateral cooperation, multilateral development banks can substantially increase their role in financing NbS in the Global South.

What the German government plans:

In the framework of the pledged increase in international climate finance to 6 billion euros per year by 2025 at the latest, which is to include raising international biodiversity finance to 1.5 billion euros per year from 2025, we will also expand international funding for Nature-based Solutions.

We will press for multilateral development banks to also make a substantially larger contribution to financing NbS.

10.4 Mainstreaming Nature-based Solutions in international cooperation

The German government is urging greater consideration and stronger integration of Nature-based Solutions in international cooperation. The goal here is an ambitious international NbS policy based on the understanding of the UNEA 5.2 Resolution on Nature-based Solutions (UNEP/EA.5/Res.5). NbS hold great potential for climate action, biodiversity conservation, climate adaptation and protection against climate risks, for raising resilience and achieving other SDGs of the United Nations.

This measure will help better integrate NbS into multilateral processes and institutions such as the Rio Conventions (UNFCCC, UNCCD, CBD), the UN system (such as UNDP) and the G7 and G20. With this we want to create a joint understanding of the advantages and potential of NbS, secure increased funding and better implementation and establish robust social and environmental standards. International cooperation will strengthen the framework conditions needed and expand opportunities for experience sharing.

Our goal for the coming years is to maintain NbS as an integral component of the work and discussions of the G7 and in future of the G20 too. Together with G7 and G20 member states, we want to become international pioneers of Nature-based Solutions.

What the German government plans:

As the German government, we will step up efforts to mainstream NbS as a priority in international and multilateral cooperation (G7, G20, Rio Conventions). We will establish platforms for exchanging experience on NbS, thus improving the understanding and integration of NbS into the Rio Conventions and the G7 and G20 formats.

Implementing and reporting on the Action Plan

The aim is to begin implementing all measures of the Federal Action Plan on Nature-based Solutions for Climate and Biodiversity during the current legislative period and establish the corresponding funding facilities.

In 2025 at the latest, the German government will publish a progress report on implementation of the Action Plan and the impact of measures relating to effective greenhouse gas reductions and other goals of the Action Plan. As far as possible, the report will be based on measurable indicators. In this context, we will evaluate the measures implemented and review whether adjustments are needed.

As many measures are long term, they will also need to be reviewed regularly beyond 2025. This must include comparing the Action Plan to the latest knowledge on the climate crisis and what is needed to combat it. In particular, trends in the emissions balance in the LULUCF sector must be considered. If the emission projections indicate that the targets for the LULUCF sector will not be achieved, measures will be adjusted to ensure that the Action Plan significantly contributes to closing the gap. This review and possible adjustment will be carried out every two years on the basis of the latest projections report. An evaluation will also be conducted to take account of developments in the EU climate framework.

Annex

Overview of measures

List of abbreviations

BauGB	Federal Building Code (Baugesetzbuch)
BBodSchG	Federal Soil Protection Act (Bundesbodenschutzgesetz)
BMBF	Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung)
BMEL	Federal Ministry of Food and Agriculture (Bundesministerium für Ernährung und Landwirtschaft)
BMUV	Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz)
BNatSchG	Federal Nature Conservation Act (Bundesnaturschutzgesetz)
BÖLN	Federal Organic Farming Scheme and other forms of sustainable agriculture (Bundesprogramm Ökologischer Landbau und andere Formen nachhaltiger Landwirtschaft)
CAP	Common Agricultural Policy of the European Union
CBD	Convention on Biological Diversity
CDR	Carbon dioxide removal
CFP	Common Fisheries Policy of the European Union
CO_2	Carbon dioxide
DAS	German Adaptation Strategy (Deutsche Anpassungsstrategie an den Klimawandel)
EU	European Union
FONA	Research for Sustainability (Forschung für Nachhaltigkeit)
GAK	Joint Task for the Improvement of Agricultural Structure and Coastal Protection (Gemeinschaftsaufgabe Agrarstruktur und Küstenschutz)
IPCC	Intergovernmental Panel on Climate Change
IPLCs	Indigenous peoples and local communities
KfW	national promotional bank of Germany
LULUCF	Land Use, Land Use Change and Forestry
MSFD	EU Marine Strategy Framework Directive

NbS	Nature-based Solutions
OUV	Outstanding Universal Value
StrÖff	Strategy for considering biodiversity concerns on federal properties (Strategie zur vorbildlichen Berücksichtigung von Biodiversitätsbelangen auf allen Flächen des Bundes)
UNCCD	United Nations Convention to Combat Desertification in those countries experiencing serious drought and/or desertification, particularly in Africa
UNDP	United Nations Development Programme
UNEA	United Nations Environment Assembly
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WFD	EU Water Framework Directive
WSV	Federal Waterways and Shipping Administration (Wasserstraßen- und Schifffahrtsverwaltung des Bundes)

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