2023 Indicator Report

of the Federal Government

for the National Strategy on Biological Diversity

Contents

1 Introduction

Biodiversity is essential to human life and health. In addition to the species diversity of plants, animals, fungi and microorganisms, biodiversity also includes habitat diversity and genetic diversity. Conserving biodiversity through protection and sustainable use secures the long-term needs of current and future generations. Alongside climate change mitigation, biodiversity conservation is one of the greatest challenges of our time.

At the United Nations Conference on Environment and Development (UNCED) in 1992, the international community adopted the UN Convention on Biological Diversity (CBD) to take global action on the dramatic loss of species, habitats and genetic diversity. Since then, Germany has vigorously supported the goals of the CBD both nationally and internationally.

In the National Strategy on Biological Diversity (NBS) adopted in 2007, the Federal Government set ambitious goals for the conservation and improvement of biodiversity and its sustainable use, implementing the global provisions of the CBD at national level. Further information on the National Strategy on Biological Diversity is available at www.biologischevielfalt.de.

One important element in the implementation of the National Strategy on Biological Diversity (NBS) is the use of indicators as part of regular, science-based, transparent monitoring of progress and target achievement. The indicators used in the National Strategy on Biological Diversity are linked to the visions and action areas set out in the Strategy. They provide an overview of the status of and trends in biodiversity in Germany and are largely based on data from long-term monitoring programmes involving standardised methodologies. They thus supply data on the status of biodiversity and the pressures that impact species and habitats. With the aid of the indicators, progress and areas for further action are highlighted for use in shaping nature conservation policy and other policy areas relevant to biodiversity conservation.

When it was first adopted in 2007, the National Strategy on Biological Diversity contained an initial set of indicators for future reporting (BMU 2007). This set of indicators has been added to and updated over the years. In the 2010, 2014 and 2019 Indicator Reports, the indicators available in each case were reported comprehensively using a standardised format (BMU 2010, BMUB 2015a, BMU 2020). The indicators were also used as a basis for evaluating the status of implementation of the National Strategy on Biological Diversity in the 2013, 2017 and 2021 Progress Reports (Rechenschaftsberichte) (BMU 2013, BMUB 2017, BMU 2021). Five of the indicators and the corresponding goals in the National Sustainability Strategy (now known as the German Sustainable Development Strategy following its revision in 2016) were adopted

in the National Strategy on Biological Diversity ("Species diversity and landscape quality", "Increase in land used for settlements and transport infrastructure", "Organic farming", "Nitrogen surplus" and "Eutrophication of ecosystems").

Compared with the 2019 report, the set of indicators has been modified as follows for this 2023 Indicator Report:

- The "Species diversity and landscape quality" indicator has been completely revised. The changes relate to the selection of species, the target values, the weighting factors and how the overall indicator is calculated. As a result, a comparison with the indicator data prior to the revision is only possible to a limited extent.
- The "Endangered species" indicator includes the Red Lists published in 2018 and 2022 (Plants and Invertebrates (Part 3)) in the calculation.
- For the "Eutrophication of ecosystems" indicator, in addition to the revision of the time series as part of the PINETI-4 project, methodological improvements have also been made compared with the previous PINETI-3 dataset.

This 2023 Indicator Report provides a final analysis of to what extent the goals and targets outlined in the 2007 Strategy have been achieved. Many of these goals were set to be achieved in 2020 (in some cases 2015), which is now in the past.

Since the 15th CBD Conference of the Parties in Montreal in December 2022 the Kunming-Montreal Global Biodiversity Framework (GBF) outlines new global biodiversity conservation goals, which now need to be implemented at national level. A monitoring framework was agreed as a component of the GBF that will facilitate comparable and transparent monitoring at international level on the basis of standardised headline indicators.

As the Federal Government's primary nature conservation strategy, the National Strategy on Biological Diversity is the key instrument used to implement international agreements on the conservation and sustainable use of biodiversity. In the course of revising the 2007 National Strategy on Biological Diversity, the Federal Government will comply with the GBF by setting out new national biodiversity goals and targets for the period up to 2030 and in some cases beyond. The new strategy will also contribute to implementing the goals outlined in the EU Biodiversity Strategy for 2030. The new NBS 2030 not only requires the timeline to be adjusted to at least 2030, but also a review of the formulated goals, targets and ambitions to align them with the new global targets and take account of available knowledge on the status of and factors influencing biodiversity.

Transparent, science-based progress reports will continue to play a central role. Thus, under the new National Strategy on Biological Diversity, the target

achievement and progress reporting process will be revised, modernised and adapted to reflect the global targets. This will also make it necessary to complete, review and update the previous set of indicators. The indicators contained in the previous set will be taken into account and the time series continued.

The process of compiling the new National Strategy on Biological Diversity 2030 is already underway. A Cabinet resolution is planned for 2024.

The 2023 Indicator Report will in no way pre-empt the federal budget or the timing of fiscal planning. Any and all measures or processes newly introduced in connection with the report are subject to budgetary approval. Due regard is to be given to the allocation of powers between the Federal Government and the Länder (federal states).

[Margin column: The indicators for the National Strategy on Biological Diversity provide an overview of the status of and trends in biodiversity in Germany. They provide information on how biodiversity is being adversely affected and the measures taken to ensure its conservation and sustainable use. Progress made and areas for further action are highlighted for use in shaping nature conservation policy and other policy areas relevant to biodiversity conservation.]

2 Set of indicators for the National Strategy on Biological Diversity

The currently 18 indicators in the National Strategy on Biological Diversity fall under five main headings:

- Components of biological diversity (7 indicators)
- Settlements and transport infrastructure (2 indicators)
- Economic uses (7 indicators)
- Climate change (1 indicator)
- Public awareness (1 indicator)

In the following section, these 18 indicators are assessed and interpreted on the basis of data as of September 2022. They are presented in a uniform format. In each case, it is shown how the indicators relate to the concrete vision (Chapter B) and action areas (Chapter C) set out in the National Strategy on Biological Diversity.

The indicator names in the section headings express the subject matter of the indicators as concisely as possible. An introductory passage explains how each indicator relates to the conservation and sustainable use of biodiversity. A section with the subheading “Indicator” defines each indicator and outlines the goal associated with the indicator in the National Strategy on Biological Diversity. The “Composition” section provides information on data sources and gives an overview of how the indicator is calculated. Changes in indicator values are interpreted in the section with the subheading “Assessment”. Recommendations for action are also given here.

All indicators are assigned a target in the form of either a general qualitative target or quantitative target values. Where there are quantitative targets, assertions can be made on the level of target achievement (status). This is determined by measuring the distance between the last data point and the target value and assigning it to one of four classes. The result is visualised using four symbols. The following category limits apply for the target achievement level:

++	Target achievement ≥ 90%	Current value within target range
+	Target achievement 80% bis < 90%	Current value close to target range
-	Target achievement 50% bis < 80%	Current value still far from target range
--	Target achievement < 50%	Current value still very far from target range

Trend information is also provided where suitable data is available. The trend is determined using a common statistical measure (Spearman's rank correlation coefficient) from the last 11 data points, thus corresponding – for example – to a 10-year period. An exception is the "Length of the vegetation period" indicator (trend calculation over the entire time series from 1951 to 2021 with 71 data points). The results of the calculations are classified as follows:

	Statistically significant trend towards target
	No statistically significant trend (no significance for rising or falling trend)
	Statistically significant trend away from target

No trend information can be provided if, for example, there are too few data points or if data points are not fully comparable within a time series.

Changes in indicators and any sub-indicators are shown in standardised diagrams. The target lines shown in the diagrams are intended to make the target values easier to understand. They provide no information as to when the respective target values apply. This information can be found in the text in the section under the sub-heading "Indicator".

An overview of the main information about each indicator is provided under the diagrams, comprising references to thematic areas in the National Strategy on Biological Diversity, the definition of the indicator, a quantitative or general qualitative target and the core assessment.

Background information and quotes – mainly from the National Strategy on Biological Diversity – are printed in the margin and supplement the textual information on each indicator.

At the end of the Report, the individual assessments for all 18 indicators in the National Strategy on Biological Diversity are combined into an overall assessment and presented in a table. The Report ends with a list of literature for further reading.

2.1 Components of biological diversity

2.1.1. Species diversity and landscape quality

Conservation of species and habitat diversity is a task for the whole of society and, alongside climate change mitigation and food security, one of the greatest challenges of our time. A rich diversity of plant and animal species is essential to the balance of nature and to human health and survival. Species diversity is closely bound up with habitat and landscape diversity. Conservation of species diversity and the diversity of biotic communities and habitats is thus a central goal of Germany's Federal Nature Conservation Act. The natural environment in Germany has been shaped by centuries of land use. The abandonment of low-intensity forms of land use coupled with continuing intensification of land use has resulted in the loss of the diversity originally found in those cultivated landscapes. Conserving and restoring Germany's species and habitat-rich landscapes requires more than protecting species and habitats via small-scale measures focusing on specific areas. What is needed instead are sustainable forms of land use that promote biodiversity in the entire landscape, lower use of pesticides, stricter limits on emissions, less fragmentation and responsible management of the natural environment across all policy areas.

So that the condition of the natural environment under the varied influence of land use can be assessed in a summarised form for Germany as a whole, an indicator was developed based on population changes in selected bird species representative of the country's primary landscape and habitat types. The sizes of bird populations (by number of territories or breeding pairs) indicate the suitability of a landscape as a habitat for the selected bird species. As birds are not the only type of fauna that depend on a richly structured landscape with intact, sustainably used habitats, the indicator also indirectly reflects trends in many other species in the landscape and in the sustainability of land use.

The "Species diversity and landscape quality" indicator was developed as a key sustainability indicator for the National Sustainability Strategy (Bundesregierung 2002) and incorporated into the National Strategy on Biological Diversity. It is thus regularly included in the Indicator Reports for the German Sustainable Development Strategy, most recently in the 2021 Indicator Report (Statistisches Bundesamt 2021a).

[Margin column: The indicator provides information about species diversity, landscape quality and the sustainability of land use.]

Indicator

The indicator provides information about trends in species diversity, landscape quality and the sustainability of land use. It combines, in a single measurement,

data on nationwide population sizes for selected, representative bird species in the country's primary landscape and habitat types.

Initially developed in 2004, the indicator was revised and adapted as part of a research project conducted between 2019 and 2022 (Dröschmeister et al. currently being complied). As part of the project, the selection of species was adjusted to take account of the improved data quality from national bird monitoring in recent years and decades. The suitability of different bird species for indicator purposes was individually analysed and certain species were replaced. Current strategies and legislation on biodiversity conservation and sustainable development were prepared in a broad consultation process. They were then used to develop landscape scenarios describing the future trends for each primary habitat and land-use form when the strategies and legislation are implemented.

To form the targets, in 2021, an expert panel used the updated landscape scenarios to determine the population size attainable for each bird species by 2030. The panel unanimously agreed that these targets can be achieved if European and national nature conservation laws, the biodiversity conversation strategies of the EU, Germany and Germany's Länder (federal states) and the principles of sustainable development are implemented swiftly.

The target values for the indicator species were set at multiples of the current population sizes. The resulting index values were subsequently standardised to 100%, resulting in a target value of 100% for each sub-indicator and for the overall indicator. The overall indicator is calculated using the four sub-indicators for farmland, forests, settlements and inland waters, which are strongly influenced by the impacts from and intensity of anthropogenic activities and use. The sub-indicators are aggregated to form the overall indicator, weighted on the basis of updated calculations on their respective share of Germany's territory. The sub-indicators for coasts and seas and the Alps are presented separately from the overall indicator, receiving greater attention as a result. Coastal regions and the Alps largely comprise protected areas, each with their own international conservation rules. Biodiversity conservation and sustainable development in these areas are highly dependent on protected area management. Also, for offshore seas, it is necessary to take into account the assessment of the EU Marine Strategy Framework Directive (MSFD), which says that seabirds and shorebirds in the German North Sea and Baltic Sea will not achieve good environmental status.

After the indicator was revised, the data series were recalculated retroactively.

Composition

The indicator is recalculated on the basis of population trends in 51 bird species representative of Germany's primary landscape and habitat types (with sub-indicators for farmland, forests, settlements, inland waters, coasts

and seas). As in the 2014 Indicator Report, reporting of the sub-indicator for the Alps has been temporarily suspended because the available data for the revised selection of species is not yet sufficiently reliable. For the sub-indicators, the Federation of German Avifaunists (Dachverband Deutscher Avifaunisten, DDA) together with other experts selected ten – for farmland eleven – representative bird species as indicator species. Based on data from the national bird monitoring programmes, a nationwide population index for each species is calculated annually by the DDA in cooperation with the Federal Agency for Nature Conservation (BfN). This population index is set in relation to the species-specific target value, giving rise to an annual level of target achievement expressed as a percentage.

For each sub-indicator, the arithmetic mean is then calculated from the target achievement percentages for all ten or eleven selected bird species. These average figures allow the status of the primary habitat or landscape types to be viewed in relation to the target value for 2030. The overall indicator is the weighted average of the sub-indicators for farmland, forests, settlements and inland waters. The weightings are based on how much of Germany's territory is accounted for by the respective main habitat type. For the suspended Alps sub-indicator, the underlying data will be improved in future years by expanding bird monitoring in the Alps. The historical figures for 1970 and 1975 are reconstructed. The underlying data for bird species is based on regular standardised surveys of representative sub-areas. The annual population sizes are determined using statistical model calculations, while figures for certain years have been extrapolated for some species. As a result of cooperation in the federal system, the overall indicator, the sub-indicator on coasts and seas and the sub-indicator for the Alps may not be equally up to date.

Table: Indicator species and weighting of primary habitat and landscape types

Primary habitat/landscape type	Weighting	Selected representative bird species
Farmland	0.49	Black-tailed Godwit, Common Buzzard, Common Starling, Corn Bunting, Grey Partridge, Meadow Pipit, Northern Lapwing, Red-backed Shrike, Skylark, Whinchat, Yellowhammer
Forests	0.29	Black Stork, Black Woodpecker, Grey-headed Woodpecker, Lesser Spotted Woodpecker, Marsh Tit, Middle Spotted Woodpecker, Nuthatch, Tree Pipit, Willow Tit, Wood Warbler
Settlements	0.13	Black Redstart, Common Redstart, Common Swift, European Serin, Green Woodpecker, House Martin, House Sparrow, Jackdaw, Swallow, Tree Sparrow
Inland waters	0.09	Common Moorhen, Common Reed Bunting, Great Bittern, Great Crested Grebe, Great Reed Warbler, Grey Wagtail, Little Grebe, Osprey, Reed Warbler, White-throated Dipper
Coasts and seas	Shown separately	Black-headed Gull, Common Guillemot, Common Redshank, Common Tern, Eurasian Curlew, Herring Gull, Little Tern, Oystercatcher, Pied Avocet, Sandwich Tern
Alps	Shown separately	Alpine Accentor, Black Grouse, Black Woodpecker, Bonelli's Warbler, Citril Finch, Grey-headed Woodpecker, Lesser Redpoll, Ring Ouzel, Three-toed Woodpecker, Water Pipit, White-backed Woodpecker, Willow Tit

Assessment

The species diversity and landscape quality indicator for 1990 was significantly below the reconstructed figures for 1970 and 1975. This reflects population crashes in many indicator species associated with farmland, settlements and inland waters in the years prior to 1990. Over the same period, the sub-indicators for forests and coasts and seas remained stable. From the beginning of the 1990s to the beginning of the 2000s, the sub-indicator for coasts and seas showed significantly higher figures than those in 1970 and 1975.

In the past ten reporting years (2009-2019), the indicator value for species diversity and landscape quality was still far from the target value. At 75% of the target value, the indicator value in 2019 was far from the target range. If the trend continues unchanged, the target for the overall indicator cannot be achieved by 2030. The sub-indicator for farmland has a decisive influence on the overall indicator. In 2019, it reached only 70% of the target value and has deteriorated significantly in statistical terms over the past ten years. The sub-indicator for settlements increased significantly in the past ten years, lying at 80% of the target value in 2019 and thus close to the target range. The sub-indicator for forests showed no statistically significant trend. At 81% of the target value in 2019, it was close to the target range. In 2019, the sub-indicator for inland waters stood at 80% and was thus close to the target range. However, it showed no statistically significant trend over the past ten years. The sub-indicator for coasts and seas likewise showed no statistically significant trend over the past ten years (in 2018, it stood at 78% of the target value and was thus far from the target range). With the exception of the sub-indicators for inland waters and coasts and seas, all sub-indicators were significantly below the comparative values for 1990. As the indicator has been revised, a direct comparison with the data from previous indicator reports can no longer be made.

In agricultural land, there has been a significant decline in populations of farmland birds that breed on arable land, grassland, the bordering fringes and woody vegetation. This reflects the trend seen in the sub-indicator for **farmland**. As reasons for this decline, studies cite the large-scale dominance of intensive farming practices that directly destroy numerous eggs, reduce the number of young birds that survive and diminish the supply of food and also the low proportion of arable fallow land and other features that characterise a diverse agricultural landscape. If the biodiversity targets and Sustainable Development Goals are to be achieved, nature-compatible forms of land use are essential.

In **forests**, an increase in the share of dead wood, more natural management practices and greater structural diversity have pushed the indicator value closer to the target range. To ensure suitable habitat quality and high species

diversity and landscape quality in forests in the longer term, what is needed is the rigorous implementation of near-natural silviculture along with intensified forest conversion to structurally rich, mixed deciduous woodlands with predominantly native tree species and even greater consideration to nature conservation aspects in forest management. In recent years, non-natural forests in particular have proven to be especially susceptible to drought damage and pest infestation. Government funding must be systematically linked to activities to conserve and promote biodiversity and must reward the outcomes beyond merely funding these measures.

Human **settlements** host species that nest in and around buildings and also others that depend on species-rich grassland, fallow land, orchards, and agricultural structures in villages and on the edges of settlements. The population development of these species shows a positive trend and is close to the target range. For the targets to be achieved, surface sealing must be reduced in settlements, sufficient alternative spaces created to accommodate species that nest in and around buildings during urgently needed energy-efficient building modernisation, new nesting boxes provided in the construction of new buildings and measures taken to combat the loss of near-natural habitats and village structures. When planning green spaces in settlements, greater consideration must be given to biodiversity aspects and near-natural management practices adopted. The effects of light, noise and emissions in settlements must be reduced and the use of pesticides avoided.

The **inland waters** sub-indicator has fluctuated in recent years, but shows no statistically significant trend. In order to increase the populations of indicator species and achieve the 2030 target, measures to restore rivers and floodplains – which are to be increasingly carried out as part of implementation of the EU Water Framework Directive and Germany's federal Blue Belt programme – will play an important role in the future development of these habitats. Efforts must be stepped up to restore and revitalise near-natural floodplains, including near-natural water body dynamics. And to ensure high levels of biodiversity, fine sediment and nutrient levels must be further reduced in many water bodies.

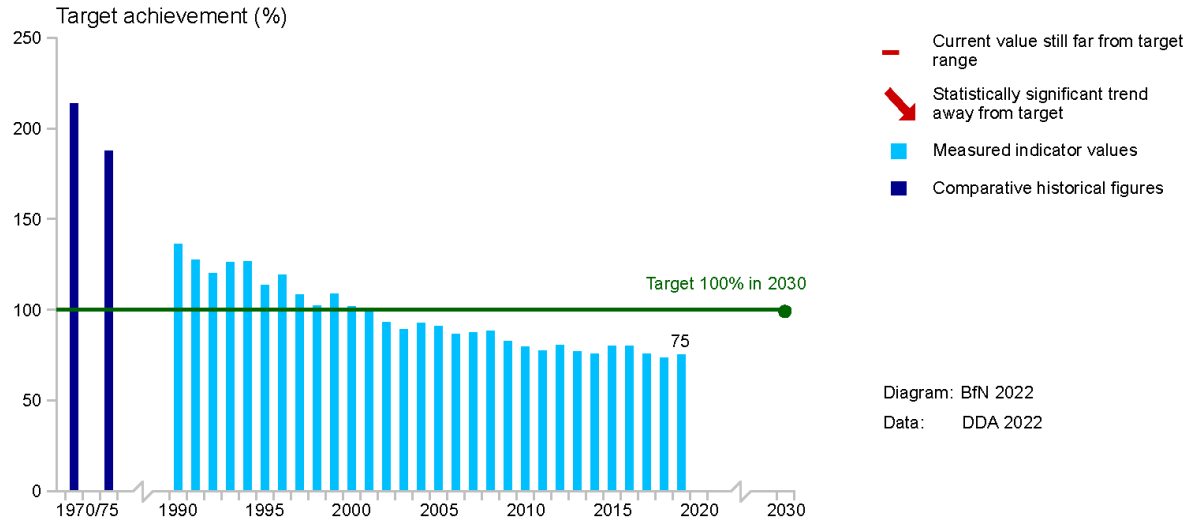
For **coasts and seas**, the group of breeding bird species has shown no statistically significant trend over the past ten years. The current indicator value is far from the target range, while values have declined significantly since the start of the 2000s. To preserve populations of fish-eating bird species, it is necessary to prevent overfishing and establish ecosystem-based fisheries, with fish stocks that show a good and near-natural age and size distribution. Functioning food webs need to be preserved and restored. The expansion of wind power and other forms of use must be compatible with nature. Breeding populations of beach and sand-dune bird species benefit from a reduction in recreational use; this must continue to be rigorously implemented in protected

areas. Sustainable management of coastal grassland is needed to promote grassland species. Additional measures are required to mitigate the impacts of climate change (such as rising sea levels and more frequent flooding). To ensure the coasts and seas indicator target can be achieved, protective measures must be intensified and refuges and resting areas created to protect birds from anthropogenic disturbances.

Summary and outlook

A significant decline in species diversity and landscape quality is evident nationwide. Studies cite the main causes – with regional differences – as intensive farming, landscape dissection and urban sprawl, soil sealing and pollutants (such as acidifiers and nutrients) affecting large areas. Further action is therefore needed to transition to nature-compatible forms of land use in the cultivated landscape. Near-natural forests and natural forest development must be promoted to ensure biodiversity conservation targets are achieved. Designating areas for natural water body dynamics helps to protect specialised species and habitats and reduces the risk of floods. In settlements, the loss of near-natural habitats and village structures has a negative impact. Infrastructure expansion (especially roads and wind turbines) leads to fragmentation in all habitats, meaning that the effects must either be avoided or compensated for where possible. Threats to coastal habitats include disturbance from increased recreational use, intensive farming and construction – for example as a result of coastal defences and wind turbines. To bring about a positive trend in the overall indicator and all sub-indicators and to achieve the targets and goals set out in the strategies and laws governing nature conservation and sustainable development, considerable additional effort is needed in all relevant policy areas at national, federal state and local government level. In the process, particular focus should be placed on the agricultural landscape.

Species diversity and landscape quality



Alt-Text:

The diagram shows the overall indicator for species diversity and landscape quality. The target value of 100% is to be achieved in 2030. More precise values are explained in the text above. The trend is moving away from the target, lying at 75% in 2019.

Thematic areas

Almost all thematic areas, notably C 1 Interlinked biotopes and networks of protected areas, C 6 Agriculture and silviculture and C 12 Rural regions and regional development

Definition

Index (measured as a percentage) of population sizes throughout Germany of selected representative bird species in primary habitat and landscape types

Target

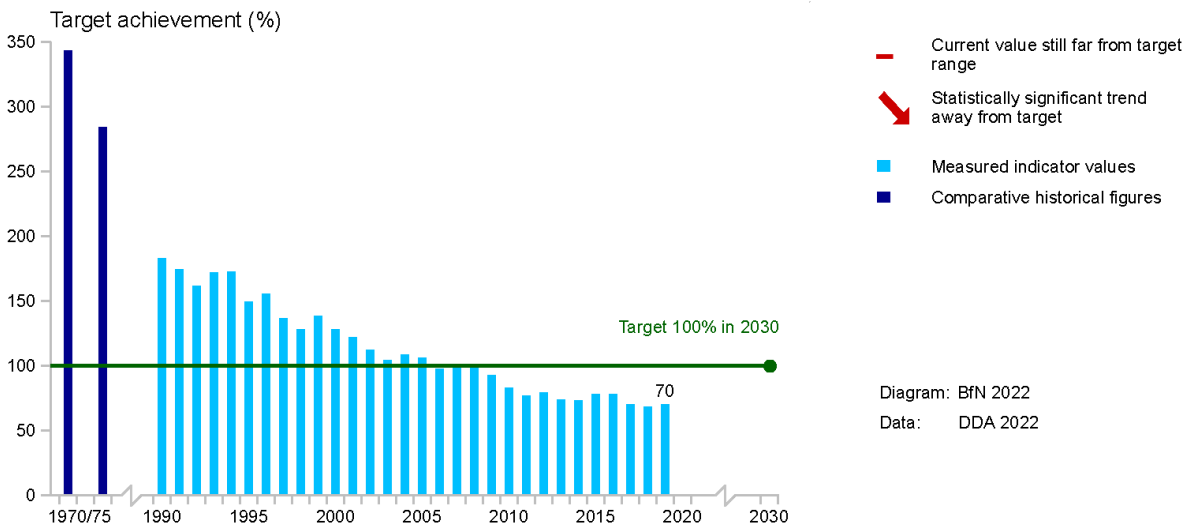
Species-specific target values were set for 2030. If the provisions of prevailing laws and current strategies governing biodiversity conservation and sustainable development are implemented, the populations of the indicator bird species will achieve the respective target values. The sub-indicators and the overall indicator will then also achieve the target in 2030.

Core assessment

In the past ten reporting years (2009 to 2019), the indicator value for the overall indicator has deteriorated significantly. The period in question saw a statistically significant trend away from the target. The aggregate value of the indicator and the values for the sub-indicators for farmland, inland waters,

coasts and seas are far from the target, while the sub-indicators for forests and settlements are close to the target range. Only the sub-indicator for settlements shows a statistically significant trend towards the target. If the trend continues unchanged, the target of 100% in 2030 for the overall indicator and for the farmland sub-indicator cannot be achieved without considerable additional effort in all relevant policy areas at national, federal state and local government level.

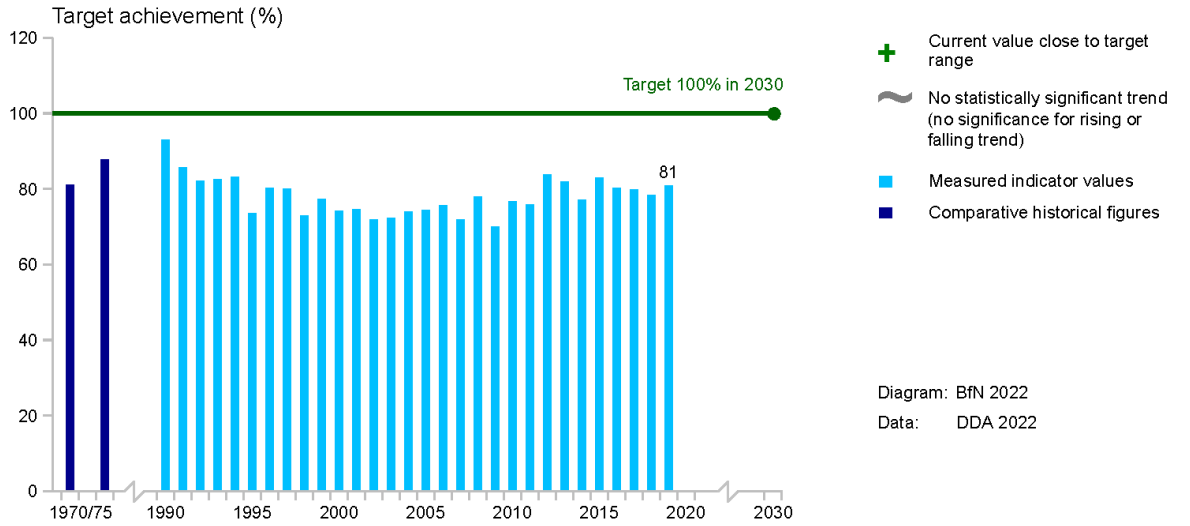
Species diversity and landscape quality - Farmland



Alt-Text:

The diagram shows the species diversity and landscape quality in farmland. The target value of 100% is to be achieved in 2030. More precise values are explained in the text above. The trend is away from the target, lying at 70% in 2019.

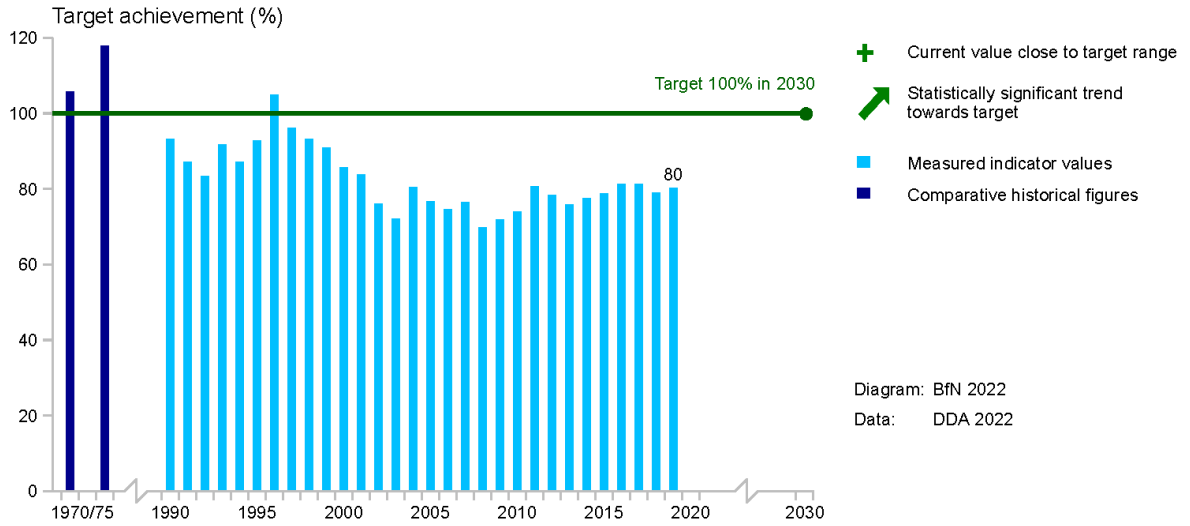
Species diversity and landscape quality - Forests



Alt-Text:

The diagram shows the species diversity and landscape quality in forests. The target value of 100% is to be achieved in 2030. More precise values are explained in the text above. At 81% in 2019, the current value is close to the target range.

Species diversity and landscape quality - Settlements

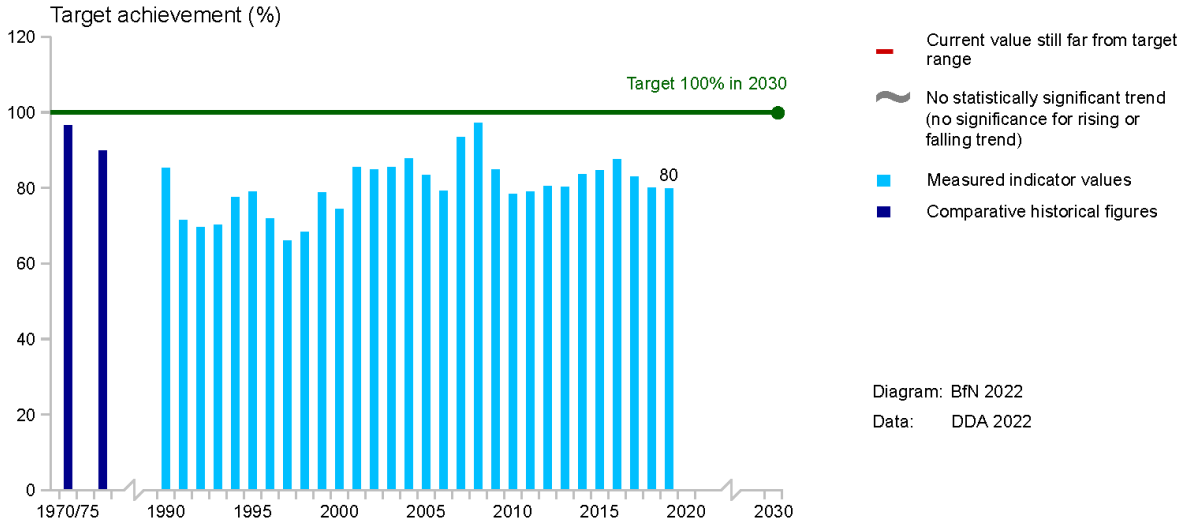


Alt-Text:

The diagram shows the species diversity and landscape quality in settlements. The target value of 100% is to be achieved in 2030. More precise values are

explained in the text above. The trend is towards the target, lying at 80% in 2019.

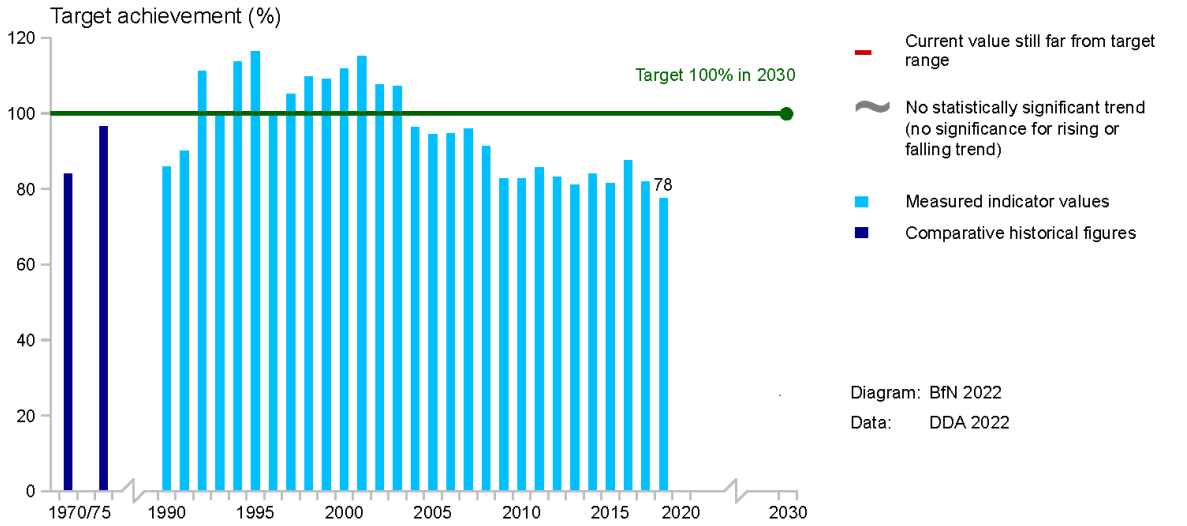
Species diversity and landscape quality - Inland waters



Alt-Text:

The diagram shows the species diversity and landscape quality in inland waters. The target value of 100% is to be achieved in 2030. More precise values are explained in the text above. The current value is still far from the target range, lying at 79.9% in 2019.

Species diversity and landscape quality - Coasts and seas



Alt-Text:

The diagram shows the species diversity and landscape quality in coasts and seas. The target value of 100% is to be achieved in 2030. More precise values are explained in the text above. The current value is still far from the target range, lying at 78% in 2018.

2.1.2. Endangered species

The National Strategy on Biological Diversity aims to halt biodiversity loss and reduce the degree to which species are endangered. Species conservation is a central action area in Germany's nature conservation policy and continues to be of great importance and urgency. It is the subject of provisions under international law and at both EU and national level. The German national Red Lists contain key information on the threat situation for each of the approximately 30,000 assessed species and are updated approximately every 10 years. Since they were first published nearly 40 years ago, the Red Lists have become increasingly important as a medium for documenting species conservation. Today, they are widely known nature conservation tools used in a variety of ways. The endangered species indicator clearly presents species endangerment in Germany based on the assessments in the Red Lists.

[Margin column: The indicator assesses the degree to which species in selected species groups are endangered.]

Indicator

The indicator represents species endangerment data from the German national Red Lists in a single measurement. The underlying data is the classifications of species into Red List categories of different threat levels up to extinction. The index provides a percentage representing the threat level for all species assessed in the Red Lists.

With a view to preserving species diversity, the National Strategy on Biological Diversity sets a target of improving the status of most Red List species by one threat level by 2020. Using this target, a specific target value of just under 11% can be calculated for 2020 based on the classification of all species assessed. The target assumes an improvement of one category level in the status of all currently endangered species. These comprise species in the categories 1 (Threatened with Extinction), 2 (Highly Threatened), 3 (Threatened) and G (Threat of Unknown Extent).

[Margin column: "By 2020, the threat situation will have improved by one level for most of the species on the Red List." (BMU 2007: 27)]

Composition

The underlying data for calculating the indicator comes from the German national Red Lists that are compiled by panels of experts and updated approximately every 10 years. The lists used for calculating the indicator are the 1996 Red List of Plants and Fungi (Ludwig & Schnittler 1996), the 1998 Red List of Animals (Binot et al. 1998) and the current editions of the German Red Lists published since 2009: Haupt et al. 2009, Ludwig & Matzke-Hajek 2011, Binot-Hafke et al. 2011, Becker et al. 2013, Gruttke et al. 2016, Matzke-Hajek et al. 2016, Metzing et al. 2018 and Ries et al. 2021. The indicator is

assessed for the groups of vertebrates, true lichens, slime moulds, macrofungi, marine macroalgae and plants and for 52 groups of invertebrates for which updated data on endangerment is available at national level. Compared with the figure most recently published in the 2019 Indicator Report for the National Strategy on Biological Diversity, the indicator has been supplemented by the Red List of Plants published in 2018 and the Red List of Invertebrates (Part 3) published in 2022. Given the expanded statistical population, the target value was also recalculated, as it depends on the number of assessed species and the threat to them. The Federal Agency for Nature Conservation (BfN) plans to continue conducting regular updates. Future assessments of the indicator will include data from the Red Lists available at the time.

When calculating the indicator, species are included with different weighting factors relative to their threat level (see Ackermann et al. 2013). The more severely endangered a species, the greater the extent to which it affects the value of the indicator. The compiled index results in a scale on which 0% would be achieved if no species were threatened, extinct or lost. At 100%, all assessed species would be extinct or lost.

Assessment

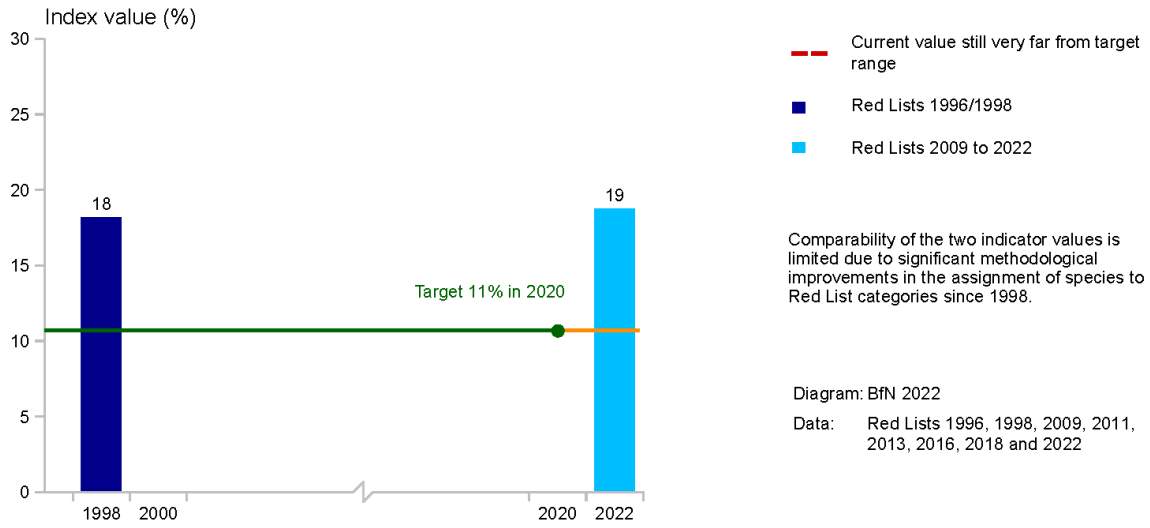
For 2022, the indicator value calculated for the groups of vertebrates, true lichens, slime moulds, macrofungi, marine macroalgae and plants and for 52 groups of invertebrates, amounts to just under 19%. This figure will decrease if the threat to species lessens in the future. The current figure is still very far from the 11% target. To reach the target value, the threat status would have to be reduced by one level for 8,726 of the 10,561 species currently accounted for. At the same time, the threat status of the remaining species may not deteriorate.

Compared with the relevant Red Lists from 1996/1998, a trend towards deterioration is evident for 2022. Methodological changes in how species are classified into Red List categories since 1998 do not prevent a direct comparison of the two indicator values. It is important to note that the species assessed in the Red Lists of the species groups considered to date account for approximately 46% of all animal, plant and fungus species found in Germany. This percentage is, however, highly representative of the diversity of organisms occurring in Germany. It also means that the diversity of habitats in which non-Red List species occur – and thus the sum of environmental factors and threats that influence the population development of animals, plants and fungi – is likewise taken into account on a representative basis. This means that these conclusions generally apply to all species diversity in Germany and their threat status.

For the species groups currently included, major species conservation efforts are needed to achieve the 11% target (as of 2022). Targeted measures must

be taken to ensure the survival of severely endangered species. Priority treatment should be given to endangered species that Germany has a high or especially high degree of responsibility for protecting. For species conservation to be successful, it is also necessary to improve knowledge about all species occurring in Germany and their threat status.

Endangered species



The indicator is assessed for the groups of vertebrates, true lichens, slime moulds, macrofungi, marine macroalgae and plants and for 52 groups of invertebrates. (N) (1996/1998) = 28,197; N (2009-2022) = 26,987. The number of species assessed has increased from 29,340 species in the old Red Lists to 33,165 species in the new Red Lists. However, as the available data was classified as inadequate for more species in the new Red Lists, the number of indicator species evaluated from the new Red Lists is lower than the number of species evaluated from the old Red Lists.

Alt-Text:

The diagram shows endangered species. The target value of 11% is to be achieved in 2020. The indicator value stands at 18% for 1998 and at 19% for 2022. The current value thus remains very far from the target range.

Thematic areas

B 1.1.2 Species diversity, C 2 Species conservation and genetic diversity

Definition

The indicator represents species endangerment data from German national Red Lists in a single measurement. The data is based on the species classifications in the Red List categories.

Target

With a view to preserving species diversity, an improvement in the status by one threat level is the goal for all currently endangered species by 2020. This results in a target value of 11% for the species groups assessed.

Core assessment

Calculated provisionally for 70 groups only, the indicator stands at 19% for 2022. Major species conservation efforts are needed to achieve the target of 11%.

2.1.3. Conservation status of Habitats Directive habitat types and species

The Habitats Directive has provided a lot of positive impetus for nature conservation work in Germany, e.g. by requiring the designation of new protected areas or rigorous assessments of interventions in the natural environment. The species and habitat types listed in its annexes represent a major cross-section of biodiversity in Germany and the EU. They are found in a very wide range of ecosystems and are of outstanding conservation value. The requirements of the Habitats Directive correspond to almost all action areas covered in the National Strategy on Biological Diversity. Assessing the conservation status of Habitats Directive habitat types[1] and species plays a key role in assessing the successes achieved under the EU Habitats Directive and the National Strategy on Biological Diversity. Every six years, the conservation status of Habitats Directive habitat types and species is assessed in a national Habitats Directive report compiled on the basis of habitats and species monitoring, other current data from the Federal Government and the Länder, and expert assessments. The report contains assessments of the conservation status of all Habitats Directive habitats and species in the three biogeographical regions in Germany (Alpine, Atlantic and Continental). The indicator represents the results for Germany in a single overall measurement.

[Margin column: The indicator provides a summary assessment of the conservation status of Habitats Directive Annex I habitats and Annex II, IV and V species in Germany.]

Indicator

The indicator is an index value calculated from assessments of the conservation status of habitats and species protected under the Habitats Directive. The underlying data is taken from the national Habitats Directive reports 2007, 2013 and 2019, including the assessment results on Annex I habitats and the occurrences of Annex II, IV and V animal and plant species covered in all three Habitats Directive reports (BfN 2009, 2014, 2019).

The National Strategy on Biological Diversity sets a goal for 2020 of significantly improving the conservation status of all Habitats Directive habitats for which good conservation status has yet to be achieved. A significant improvement in the conservation status of all coastal and marine species and habitats is likewise to be achieved by 2020. A target value for the indicator is arrived at by applying this goal to all protected habitats and species and hence

1 The Habitats Directive protects particular occurrences of specific habitats. These are grouped into abstract habitat types as listed in Annex I of the Habitats Directive.

to all species listed in Annexes II, IV and V of the Habitats Directive. This corresponds to the Habitats Directive objective of maintaining or restoring all Annex habitats and species at a favourable conservation status. If the conservation status of Habitats Directive habitat types and species with an unfavourable conservation status improves by at least one level, this is considered a significant improvement. The target value is therefore the index value that will be achieved if the assessments of all species and habitats with an unfavourable conservation status in the 2007 report improves by exactly one category. This target is then rounded off to make it easier to communicate. The outcome is a target value of 80% for 2020.

[Margin column: In the National Strategy on Biological Diversity, the target is formulated as follows: "By 2020, all stocks of habitat types (in accordance with Annex I of the Habitats Directive), protected (Section 30 of the Federal Nature Conservation Act (BNatSchG)) and endangered biotope types as well as those for which Germany has a particular responsibility, or which are particularly significant for migratory species, indicate a significant improvement in their conservation status compared with 2005, in those cases where a good conservation status has not yet been achieved." (BMU 2007: 29)]

[Margin column: For coastal and marine regions, the National Strategy on Biological Diversity sets a goal of significant improvement in the conservation status for all species and habitats by 2020 (BMU 2007: 33).]

[Margin box: The Federal Government's objectives with a view to conserving habitats and species protected under the Habitats Directive:

Permanent protection of Natura 2000 areas, including provision of the necessary financing (action area C1, "Interlinked biotopes and networks of protected areas")

Formulation and implementation of species conservation programmes to conserve and rehabilitate specific species and species groups (action area C2, "Species conservation and genetic diversity"

Review of agricultural and environmental policy measures with a view to sustainability and financially viable opportunities to further improve nature compatibility within the context of EU agricultural support and national/European agricultural and environmental policy (action area C6, "Agriculture and silviculture")

Composition

The indicator is calculated from assessments of the conservation status of the Habitats Directive species and habitats separated into the three biogeographical regions relevant to Germany. Only the number of assessments of habitat types or species is taken into account. This information

is taken from the national Habitats Directive reports compiled every six years. The indicator currently combines the findings of the 2007 report (2001-2006 reporting period), the 2013 report (2007-2012 reporting period) and the 2019 report (2013-2018 reporting period). The assessment of conservation status is classified into three levels shown as the colours of a traffic light: “Favourable” (green), “Unfavourable – inadequate” (yellow) and “Unfavourable – bad” (red). An extra “Unknown” category is used where assessment is not possible due to inadequate data. In addition, information on the overall trend in the conservation status during a reporting period is included in the calculation, which results in a more finely nuanced conclusion. The trends are as follows: improving (positive) trend (+), worsening (negative) trend (-), neutral trend (=) and unknown trend (x). When calculating the index, the protected habitats and species are weighted according to the assessment of the conservation status and the trend. The better the assessment, the higher the weighting factor. The indicator value is 0% if the conservation status of all included habitats and species is found to be unfavourable–bad and 100% if the conservation status of all included habitats and species is found to be favourable. When compiling the indicator, habitats and species with an unknown conservation status are not taken into account. Habitats and species found in more than one biogeographical region are included multiple times in the index.

Sub-indicators are calculated the same way as the overall indicator, in each case for a selected sub-set of the Habitats Directive habitats and species – for example, all Habitats Directive habitats and species predominantly found in coastal and marine regions.

Assessment

For the 2013-2018 reporting period, the index value stands at 43%. This is a good seven percentage points lower than in the first reporting period, 2001-2006. The index value for species is 43% in the 2019 reporting year, a good five percentage points lower than in the 2007 reporting year; for habitats the index is 46%, a good 11 percentage points lower. The value for habitats has thus decreased to a greater extent than the value for species. Given that a favourable conservation status of Habitats Directive habitat types is also a prerequisite to preserve many endangered species in the long term, great importance is attached to their protection and improving their conservation status.

It should be noted that changes in conservation status do not always reflect real improvement or deterioration and may relate instead to more accurate data, better knowledge or methodological changes. Looking solely at real improvement or deterioration in conservation status in all three biogeographical regions between the two reporting periods 2001-2006 and 2007-2012, 16 species improved and 18 deteriorated, while no habitats improved and 13 deteriorated. Compared with the reporting periods 2007-2012

and 2013-2019, 2 species improved and 12 deteriorated, while no habitats improved and 15 deteriorated (Ellwanger et al. 2014; Müller et al. 2022). The trend assessments for the 2019 Habitats Directive report reflect a positive trend for 14% of species and a negative trend for 34% of species. For habitats, 10% of the assessments indicate a positive trend, while 41% show a negative trend.

The indicator values for Germany's three biographical regions vary significantly. In the reporting period 2013-2018, the indicator stands at just under 73% in the Alpine region (ALP), while in the Continental (CON) and the Atlantic region (ATL), the indicator only reached a value of around 35% and 32%, respectively.

Table: Indicator values for the three biogeographical regions: ALP (alpine region), CON (Continental region), ATL (Atlantic region) (Source: BfN 2019)

Year	ALP Species	ALP Habitats	**ALP Total**	CON Species	CON Habitats	**CON Total**	ATL Species	ATL Habitats	**ATL Total**
2007	71%	79%	**74%**	42%	52%	**45%**	42%	42%	**42%**
2013	68%	79%	**72%**	44%	40%	**43%**	38%	31%	**35%**
2019	68%	80%	**73%**	35%	35%	**35%**	35%	29%	**32%**

Relative to the total number of Habitats Directive species and habitat types occurring in Germany's three biogeographical regions, the percentage assessed as "red" in the reporting period 2013-19 was 33% for species and 37% for habitats, the percentage assessed as "yellow" was 30% for species and 32% for habitats, and the percentage assessed as "green" was 25% for species and 30% for habitats (Müller et al. 2022). The indicator value and the high percentage of habitats and species assessed as "yellow" and "red" shows that much remains to be done to improve the conservation status of Habitats Directive habitat types and species in Germany – which can often only be achieved in the medium to long term – and hence for the conservation of biodiversity overall. The Habitats Directive aims at favourable conservation status of the habitats and species it protects. The Natura 2000 network of protected areas is a key policy instrument in this regard. However, occurrences found outside of Habitats Directive sites are also included in the conservation status assessment.

Sub-indicators are calculated the same way as the overall indicator but relate in each case to a selection of Habitats Directive species and habitats, such as those linked to specific formations (forests, lakes and ponds, peatlands, etc.) (see table). The results highlight the fact that the need for action is greater for habitats and species associated with peatlands (36%), coasts and seas (34%) and ecosystems characterised by agriculture that depend on management

measures and nature-compatible use (34%) than for habitats and species associated with forests (56%) and mountains (66%). In the case of forest habitat types (56%), Germany's extensive beech forest habitats (around 1.5 million hectares) are for the most part at the targeted favourable conservation status. But in many places, beech forests – and not only those in dry locations – have suffered severe crown damage since the extreme weather years 2018 to 2020 and 2022. By way of contrast, the status of oak-dominated forest habitats, most of which are highly valuable from a nature conservation perspective, is almost exclusively unfavourable. Many of these are remnants of historical forms of land-use management and grow on "secondary sites" naturally dominated by beech forest. Their conservation is dependent on the use of ongoing, complex and expensive silviculture management practices that run counter to natural forest dynamics. The status of water-dependent forest habitats is mostly "unfavourable-bad", with interventions in the water regime cited as the main cause.

Table: Values for selected sub-indicators for the reporting period 2013-2018 (Source: BfN 2019)

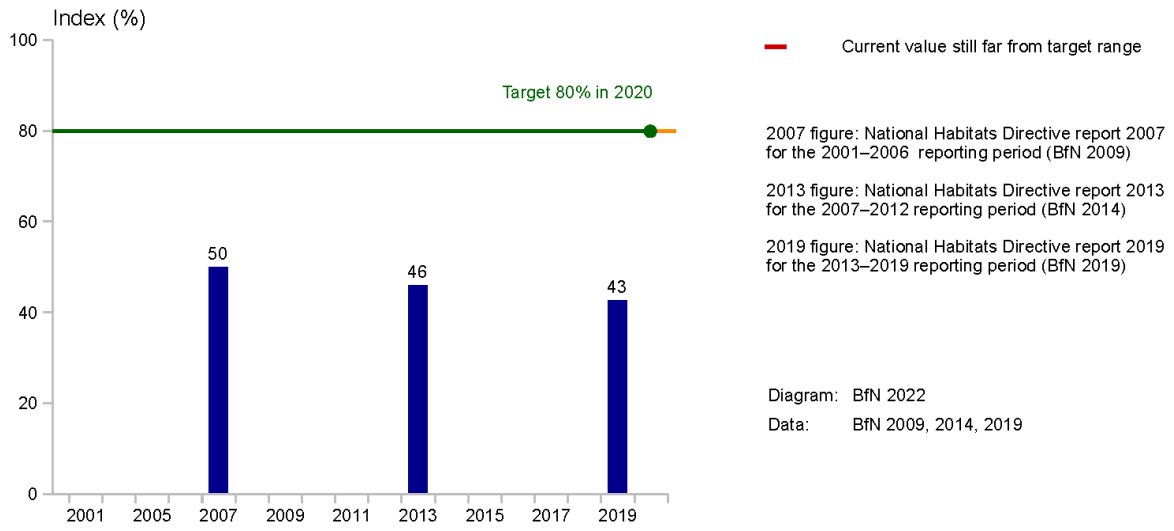
Sub-indicators	**Value**
Conservation status of habitats and species in specific formations as in Chapter B 1.2 of the National Strategy on Biological Diversity	Coasts and seas: 34% Lakes, ponds, pools and lagoons: 41% Rivers and floodplains: 42% Peatlands: 36% Mountains: 66%
Conservation status of habitats and species dependent on or significantly influenced by agriculture (open farmland only, including historical forms of use)	34%
Conservation status of forest habitats and species	56%

In the last reporting period, the situation of many species and habitats has stabilised or even improved through targeted measures, notably in the form of nature conservation measures. In many instances, however, these measures were not enough to counter negative influences or deterioration elsewhere. Due to EU infringement proceedings against Germany, the Federal Government and the Länder currently give high priority to drawing up Habitats Directive management plans in the Natura 2000 protected areas network. By March 2022, conservation measures had been established for 99% of all Habitats Directive sites.

As many protected habitats and species also occur outside Habitats Directive sites, measures may also be necessary to maintain or achieve favourable conservation status overall. In particular, many species and habitats of the open countryside are dependent on sustainable, nature-compatible management measures.

The conservation status of many habitats and species depends on the type of land use, something that is not within the direct sphere of influence of nature conservation. Improvements in conservation status therefore require the combined effort of conservationists, land users and other relevant stakeholders; cooperation should thus be intensified.

Conservation status of Habitats Directive habitat types and species



Alt-Text:

The diagram shows the conservation status of Habitats Directive habitat types and species as a percentage. The target value of 80% was to be achieved by 2020. The indicator value stood at 50% in 2007, at 46% in 2013 and at 43% in 2019. The value is currently still far from the target range and has steadily declined over time.

Thematic areas

Main thematic areas: B 1.1 Biodiversity, B 1.2 Habitats, C1 Interlinked biotopes and networks of protected areas, C2 Species conservation and C6 Agriculture and silviculture

Definition

Index (measured as a percentage) of the weighted conservation status (the better the assessment, the higher the weighting factor) of the Habitats Directive habitats and species in the three biogeographical regions of Germany

Target

An improvement in the conservation status of all habitats and species classified as “unfavourable” in the 2007 report by at least one category (corresponding to an index value of 80%) by 2020.

Core assessment

Based on the Habitats Directive report for 2019 (reporting period 2013-2018), the indicator value stands at 43%. This is still far from the target range. Efforts to improve the conservation status of Habitats Directive habitat types and species must thus be significantly intensified.

2.1.4. Invasive alien species

An alien species is classified as invasive if its presence outside its natural range poses a significant potential threat to naturally occurring ecosystems, habitats or species. This is the case, for example, when the spread of an invasive alien species displaces indigenous species at certain locations and thus endangers their existence. Germany has a long history of settlement and land use which has led to the extensive introduction of species from other parts of the world. In the vast majority of cases, these new alien species have turned out to be non-invasive. While certain invasive alien species do constitute a major potential threat in Germany, by global standards the overall threat level is far lower than is the case, for example, on remote islands.

Alien species enter Germany primarily as a result of international transport and trade flows, which may endanger native species and habitats. Alongside negative impacts on nature conservation, invasive alien species can also have adverse economic impacts (e.g. on forestry and agriculture) or negative effects on human health (e.g. skin inflammation from giant hogweed).

Regulation (EU) No 1143/2014 of the European Parliament and of the Council on the prevention and management of the introduction and spread of invasive alien species (the IAS Regulation) entered into force on 1 January 2015. At the core of the Regulation is a list of invasive alien species of Union concern (Union list) for which future management measures are defined. Using risk assessments and scientific evidence, the list is drawn up, adopted and regularly updated by the European Commission in conjunction with the Member States. Each species must meet certain criteria to be included in the list.

In some cases, measures have already significantly pushed back individual invasive alien species on the Union list (e.g. water primrose in Lower Saxony and yellow skunk-cabbage in the Taunus region). When planning measures to stop the spread of invasive alien species in Germany, special priority is given to species that are just beginning to spread (early stage of invasion) where immediate measures can be taken with the aim of completely eradicating the populations (see Article 16 et seq. of Regulation (EU) No 1143/2014).

Various invasive alien species have been able to spread widely in Germany over a longer period and are thus classified as widely spread under Regulation (EU) No 1143/2014. Management measures for widely spread invasive species, which generally have a high potential for reproduction and dispersal, usually have only limited success. They should aim to minimise the negative impact of these species on certain species, habitats or areas requiring special protection and, where appropriate, on human health or the economy (see Article 19 of Regulation (EU) No 1143/2014).

[Margin column: The indicator assesses the number of invasive species in Germany that are on the Union list in Regulation (EU) No 1143/2014 and are in the early stage of invasion.]

Indicator

The indicator is based on the Union list of invasive alien species that is legally binding for Germany under Regulation (EU) No 1143/2014. The first Union list entered into force in 2016 and contained a total of 37 invasive alien species. Another 29 invasive alien species in total were added in 2017 and 2019. The third update of the Union list entered into force on 2 August 2022 with an additional 22 invasive species, although the list does not take effect in three cases until 2 August 2024 and in one case until 2 August 2027. Further additions to the Union list are expected to follow.

For the indicator, two sub-indicators are calculated:

- The first sub-indicator represents the absolute number of species in Germany that are in the early stage of invasion and are not yet considered established (Article 16 et seq. of Regulation (EU) No 1143/2014). All species that have been found in Germany are taken into account (status in the environment: “variable” or “few occurrences”).
- The second sub-indicator reported is the number of invasive alien species that were originally listed under the first sub-indicator, but have overcome the early stage of invasion since 2010 and are now considered widely spread. These have thus been transferred from the first sub-indicator to the second sub-indicator. This describes the extent to which ecosystems, habitats and species are threatened by invasive alien species that are newly established in Germany, may already be spreading rapidly and against which no suitable or successful immediate eradication measures have been possible.

The aim is to prevent the number of invasive alien species from increasing. If the measures implemented are successful, it is possible that the number of species may decrease again at an early stage of invasion.

[Margin column: “Non-native species (neobiota) enter Germany primarily as a result of international transport and trade flows, which may endanger or displace native varieties.” (BMU 2007: 27f)]

Composition

The number of invasive alien species on the Union list under Regulation (EU) No 1143/2014 occurring in Germany is totalled across all species groups. Invasive alien species from five species groups (vascular plants, mammals, birds, fish and insects) are currently present in Germany. With the addition of further species to the Union list, the underlying data for the two sub-indicators will expand, so that the indicator values will likely also change retroactively.

Assessment

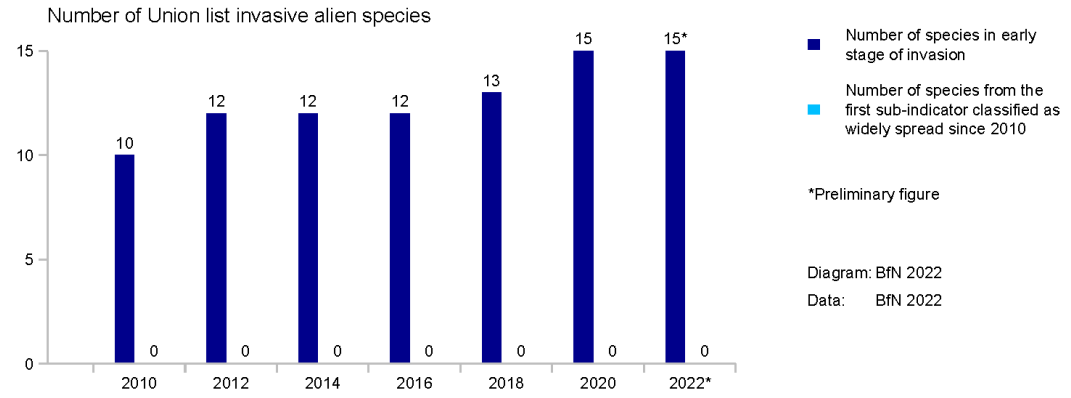
In 2022, 15 Union list species occurred in Germany that were in the early stages of invasion (as of 2 August 2022 – see the table below – six vascular plant species, three mammal species, three bird species, two fish species and one insect species). This is an increase by five species compared with 2010. With the third update of the Union list, the newly listed Eastern Mosquitofish (*Gambusia holbrooki*) was retroactively included with effect from 2010. Under Article 17 of Regulation (EU) No 1143/2014, immediate measures are to be taken against species in the early stage of invasion. None of the species in the first sub-indicator has become established in Germany since 2010. Currently, the second sub-indicator, which represents the species considered widely spread compared to 2010, thus has a value of zero. However, the goal of removing invasive species from the first sub-indicator list as a result of successful eradication measures has not yet been achieved, as new species are still being introduced even though immediate measures have been taken. It can, however, be assumed that the restrictions under Article 7 (1) of Regulation (EU) No 1143/2014 on keeping and breeding and on transport and trade, which apply to all species on the Union list, will successively minimise the introduction of new invasive species in the future.

In its National Strategy on Biological Diversity, the Federal Government proposed a range of measures to reduce the impact on biodiversity from invasive alien species. With the entry into force of the Invasive Alien Species Regulation (Regulation (EU) No 1143/2014), the Member States are required to initiate appropriate management measures. Special importance must be attached to prevention in order to counter threats to ecosystems, habitats or species from invasive alien species. Any invasive alien species reaching Germany must be prevented from becoming established and spreading further by means of early detection and immediate measures.

Table: Species on the Union list of Regulation (EU) No 1143/2014 (as of 2 August 2022) that occur in Germany and are in the early stage of invasion (Article 16 et seq.)

Scientific name	Common name	Occurrence	Status
Tracheophyta	**Vascular plants**		
Cabomba caroliniana	Carolina fanwort	from 2010	Variable
Eichhornia crassipes	Water hyacinth	from 2010	Few occurrences
Heracleum sosnowskyi	Sosnowsky's hogweed	from 2020	Few occurrences
Humulus scandens	Japanese hop	from 2010	Variable
Ludwigia peploides	Floating primrose-willow	from 2018	Few occurrences
Salvinia molesta	Giant salvinia	from 2010	Variable
Mammalia	**Mammals**		
Muntiacus reevesii	Muntjac deer	from 2010	Few occurrences
Nasua	Ring-tailed coati	from 2010	Few occurrences
Sciurus carolinensis	Grey squirrel	from 2020	Few occurrences
Aves	**Birds**		
Acridotheres tristis	Common myna	from 2010	Few occurrences
Oxyura jameicensis	Ruddy duck	from 2010	Variable
Threskiornis aethiopicus	Sacred ibis	from 2010	Few occurrences
Pisces	**Fish**		
Gambusia holbrooki	Eastern mosquitofish	from 2010	Few occurrences
Perccottus glenii	Chinese sleeper	from 2012	Variable
Insecta	**Insects**		
Vespa velutina nigrithorax	Asian hornet	from 2012	Variable

Invasive alien species



Alt-Text:

The diagram shows the invasive alien species on the Union list. Between 2010 and 2022, the number of detected invasive alien species at an early stage of invasion rose from ten to 15.

Thematic areas

B 1.1.2 Species diversity, C 3 Biosafety and preventing the adulteration of fauna and flora

Definition

The number of Union list invasive alien species separated into the number of species in the early stage of invasion and the number of species that since 2010 have overcome the early stage of invasion and are now considered widely spread.

Qualitative target

The number of new invasive alien species spreading in Germany must be minimised; an increase in the number of widely spread invasive alien species must be prevented.

Core assessment

Immediate measures must be taken to combat 15 invasive alien species on the Union list that were in the early stage of invasion in 2022. Since 2010, none of the species in the first sub-indicator has been classified as widely spread in Germany.

2.1.5. Protected areas

The designation of endangered and valuable sites as protected areas is a key nature conservation instrument. Protected areas are important refuges for plant and animal life in our landscape. In the National Strategy on Biological Diversity, the “Interlinked biotopes and networks of protected areas” action area highlights the importance of designating protected areas and linking them in a network for biodiversity conservation.

Germany has various protected area categories subject to differing legal requirements. With the exception of those located in the Exclusive Economic Zone (EEZ)[2], protected areas are designated by the Länder. To ensure the conservation and development of rare and endangered species and habitats, strict conservation rules apply in nature conservation areas and national parks. In the case of national parks, their large size and undisturbed development also play an important role. The aim is to let nature develop undisturbed (philosophy of “letting nature be nature”) in as much of the park as possible. In addition to national parks, these protection requirements are also met by the core areas of biosphere reserves and most recently by other protected wilderness areas (a small number of which are certified by Nationale Naturlandschaften e.V.). These are, however, only included in the indicator if they are also designated as nature conservation areas or national parks. In Germany, nature conservation areas and national parks are vital instruments used in biodiversity conservation. They form key elements of the national habitat network to be established under Article 21 of the Federal Nature Conservation Act (BNatSchG) and of the German part of the European Natura 2000 protected areas network. They also play an important role in efforts to establish a global protected area network. The size of the two categories of protected areas, nature conservation areas and national parks, therefore serves as an indicator of the National Strategy on Biological Diversity for area protection measures.

In addition to national parks and nature conservation areas, Germany has a wide range of other protected area categories, such as the European Natura 2000 protected areas network and biosphere reserves. These categories overlap in some cases with nature conservation areas and national parks.

[Margin column: The indicator assesses the designation of strictly protected areas as area protection measures.]

[Margin column: The Federal Nature Conservation Act provides for a number of categories with differing protected status: nature conservation areas,

[2] Between two and 200 nautical miles from the coast

national parks, national nature monuments, biosphere reserves, landscape protection areas, nature parks, natural monuments, protected landscape elements and legally protected biotopes (Articles 23-30 of the Act) and Natura 2000 sites (Article 32).]

Indicator

The indicator for the size of protected areas represents the percentage of Germany's land area accounted for by national parks (NLPs) and nature conservation areas (NCAs). For this indicator, the area of land designated as NCAs and NLPs is expressed as a percentage of Germany's land area. Other protected area types are only included if they are designated as NCAs or NLPs.

In the National Strategy on Biological Diversity published in 2007, which is currently being revised, the Federal Government sets various targets relating to protected areas. By 2010, Germany aimed to have a representative and functional system of interlinked biotopes covering 10% of its territory. A further aim was for nature to be able to develop undisturbed on 2% of Germany's territory by 2020. Completion of the European Natura 2000 network of protected areas was also planned for 2010. The designation of protected areas (NCAs and NLPs) makes a significant contribution to achieving these goals.

Composition

The Länder have been reporting data on the size of NCAs and NLPs to the Federal Agency for Nature Conservation (BfN) on an annual basis since 2000. For this purpose, the area of land designated as NCAs and NLPs is expressed as a percentage of Germany's land area. The respective percentages are presented both separately and as a combined total for the reporting years. In some places, areas have been designated as both NCAs and NLPs, such as in the Unteres Odertal National Park. For the purposes of this indicator, these areas are counted only once as national park. However, the overlap amounts to less than 1% of the total area of these protected area types. The percentages of land in other protected area types also designated as NCAs or NLPs are not listed separately.

[Margin column: The "Interlinked biotopes and networks of protected areas" action area in the National Strategy on Biological Diversity highlights the central importance of designating protected areas and linking them in a network for the conservation of biodiversity (BMU 2007: 64): "One of the main ways of conserving species diversity and genetic diversity of wild fauna and flora varieties is by protecting their habitats. The system of interlinked biotopes and networks of protected areas play a central role in conserving reproduction-viable populations."]

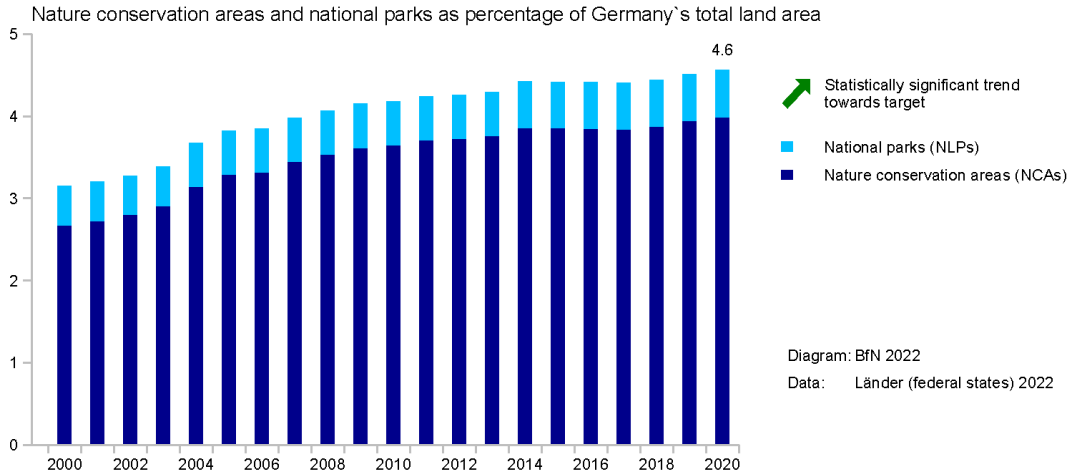
[Margin column: "By the year 2020, throughout 2% of Germany's territory, Mother Nature is once again able to develop undisturbed in accordance with her own laws, and areas of wilderness are able to evolve. By 2010, Germany has a representative and functional system of interlinked biotopes covering 10% of its territory. This network lends itself to permanently protecting the habitats of wild species and is an integral component of a European system of interlinked biotopes." (BMU 2007: 28)]

Assessment

The area of land designated as NCAs and NLPs increased from 1.1 million ha in 2000 (3.2% of Germany's land area) to 1.6 million ha in 2020 (4.6%). While the area accounted for by NCAs is subject to constant change and grew steadily from 2000 to 2014, the area covered by NLPs only increased between 2003 and 2004 after the establishment of the Eifel National Park in North Rhine-Westphalia, the Kellerwald-Edersee National Park in Hesse, the Black Forest National Park in Baden-Württemberg in 2014 and the Hunsrück-Hochwald National Park in Rhineland-Palatinate and Saarland in 2015. The increase in the size of NCAs and NLPs can be partly attributed to the implementation of the Natura 2000 network. As the process of placing designated Natura 2000 sites under protection is now well advanced in Germany, the size of NCAs and NLPs is only expected to increase by a moderate amount in the foreseeable future. This is mainly because most of the areas are now legally protected and the Länder select forms of protection other than designating areas as NCAs and NLPs.

In addition to designating protected areas by law, it is also necessary to provide effective management and maintenance of the areas in line with the defined nature conservation objectives. It is also important to ensure good connectivity between protected areas. At present, a qualitative assessment can only be made for some of the areas covered by the indicator. Germany's national parks were evaluated and the results published by EUROPARC Germany in 2013. No systematic evaluation of German nature conservation areas has been carried out so far.

Protected areas



Alt-Text:

The diagram shows the percentages of protected areas attributable to nature conservation areas and national parks. From 2000 to 2020, a statistically significant upward trend is evident from 3.2% to 4.6%.

Thematic areas

B 1.1.3 Diversity of habitats, C 1 Interlinked biotopes and networks of protected areas

Definition

Total size of nature conservation areas (NCAs) and national parks (NLPs) as a percentage of Germany’s land area.

Qualitative target

The designation of protected areas (NCAs and NLPs) makes an important contribution to protecting the national biotope network and placing Natura 2000 sites under protection.

Core assessment

The total size of nature conservation areas and national parks increased between 2000 and 2020 from 3.2% to 4.6% of Germany’s land area.

2.1.6. Ecological status of surface waters

Clean, near-natural waters are vital to biodiversity conservation of in Germany. Rivers, streams, lakes, transitional and coastal waters are home to numerous species and habitats that are highly sensitive to impairments such as nutrient inputs, contamination and technical structures. Until the 1970s, waters were severely polluted by wastewater from sewage treatment plants and industry and by run-off from nearby farmland. In recent decades, diverse water conservation efforts have improved both chemical and biological water quality so that many animals and plants have returned to the cleaner waters. The improvement in water quality is mainly due to the reduction of wastewater levels, while diffuse nutrient inputs – especially from agriculture – have decreased only slightly. As a result of the persistently high nutrient levels in waters, many water bodies have excessive nutrient concentrations. In addition, major deficits in water body structure impair the ecological status of waters. Technical structures, river straightening and floodplain drainage have resulted in structural deterioration, loss of species diversity and changes in natural discharge dynamics. Due to some 200,000 transverse structures, many organisms and sediment cannot flow unhindered down streams and rivers. These profound changes as well as the excessive inputs of fine sediments, pollutants and nutrients are major stress factors in Germany's waters today.

According to the requirements of the Water Framework Directive 2000/60/EC, an integrated approach is pursued for the conservation and use of European surface waters. The objective is to achieve good ecological and chemical status, which is defined as no more than a slight deviation from the prevailing natural conditions. In heavily modified and artificial water bodies – that have been created or significantly adapted for specific uses – the aim is good ecological potential. This means that all natural habitats compatible with water body use must be restored. This indicator represents good ecological status and good ecological potential. For the sake of clarity, both conditions are referred to collectively as "ecological status" in the indicator.

[Margin column: The indicator provides information on the ecological status of rivers, streams, lakes, transitional and coastal waters.]

Indicator

The indicator represents the percentage of surface water bodies – sections of rivers, streams, lakes, transitional and coastal waters – with good or high ecological status as a percentage of all water bodies assessed (slightly more than 9,700 in 2021). Under the Water Framework Directive, water assessment is based on the organisms living in the water, as the composition of the aquatic biotic communities reflects the influencing factors for each water type.

In accordance with the provisions of the EU Water Framework Directive and with the objectives of the National Strategy on Biological Diversity, the general aim is at least good ecological status in all surface water bodies by 2021. For heavily modified and artificial water bodies, the goal is what is termed good ecological potential. It should be noted that the Water Framework Directive allows the set deadlines to be extended up through 2027 and for exceptions when it comes to reaching the objectives.

[Margin column: "By 2015, a good ecological and chemical quality status has been achieved for all waters in the coastal region." (BMU 2007: 33)]

[Margin column: "By 2015, as a minimum requirement, a good ecological and chemical status (Water Framework Directive) has been achieved [for lakes, ponds and pools] …" (BMU 2007: 34)]

Composition

The indicator is based on water status monitoring under the Water Framework Directive. The ecological status of individual sections of rivers, lakes and coastal waters is assessed in the process. The water body is the basic unit surveyed. Water bodies are considered distinct where there is a change in category (river, lake, transitional or coastal waters), type (e.g. gravel-bed river, low-lying sand-bed stream) or status (e.g. good, moderate). The waters surveyed consist of watercourses with a catchment area of at least 10 km^2 and lakes of at least 50 ha. Almost 9,700 water bodies were identified in Germany (9,000 in rivers and streams, 737 in lakes, five in transitional waters and 71 in coastal waters).

The ecological status of a water body is determined by measuring how far it diverges from the natural state in terms of its biotic community and is assessed based on the occurrence and frequency of biological quality elements (species typical for the respective water body type): fish, invertebrates, macrophytes and algae. There are five status levels: high, good, moderate, poor and bad. The biological quality element with the lowest rating determines the status of the water body. The invertebrate fauna (macrozoobenthos), fish fauna and flora (macrophytes, phytobenthos and phytoplankton) are used for the assessment. If the environmental quality standard for a regionally significant pollutant is not met, the ecological status can be rated as moderate at best.

Physical and chemical parameters such as nutrient levels, temperature and salinity must also be in a range that allows ecosystems to function.

The results of monitoring the ecological status of surface water bodies are documented every six years in management plans. The first management cycle ran from 2009 to 2015 and the second from 2015 to 2021. Data on the ecological status of surface water bodies is thus available for 2009, 2015 and 2021 and will be available subsequently every six years.

[Margin column: "By 2015, in accordance with the requirements of the Water Framework Directive, a good ecological and chemical status or ecological potential of the rivers has been achieved; ecological passability has been restored. […] Populations of fish fauna characteristic of the respective watercourse are permanently protected." (BMU 2007 35)]

[Margin column: Macrozoobenthos: Bottom-dwelling invertebrates visible to the naked eye

Macrophytes: Water plants visible to the naked eye

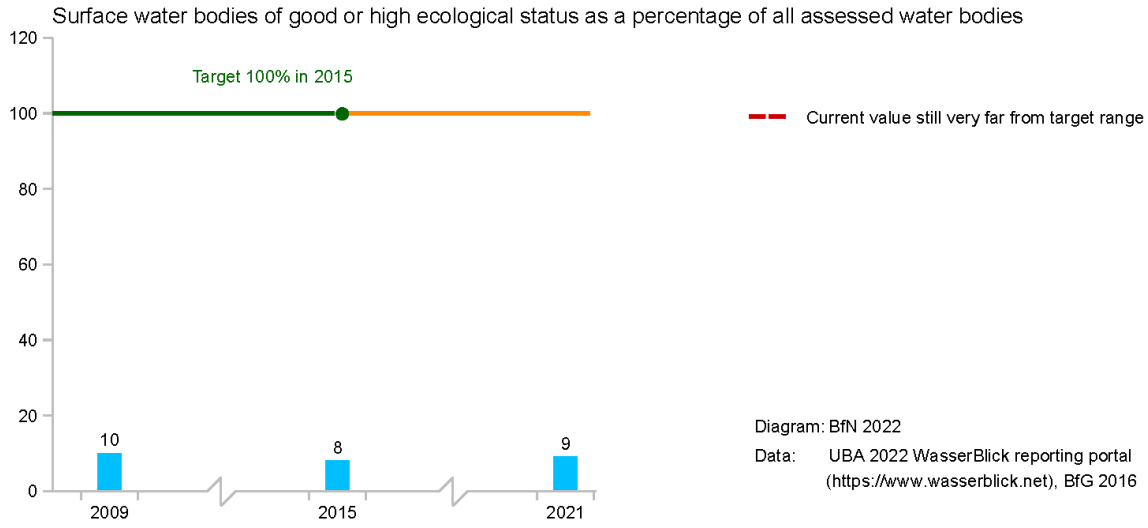
Phytobenthos: Bottom-dwelling algae

Phytoplankton: Floating algae]

Assessment

Applying the quality standards of the Water Framework Directive, only 9% of German waters achieved good or high ecological status or at least good ecological potential in 2021. This overall result essentially reflects the assessment for watercourses in Germany (8% of which achieved good or high ecological status), as these account for the majority of water bodies. The result for lakes was more positive, with 25% achieving good or high ecological status. The situation was very poor for coastal and especially transitional waters, where almost all water bodies failed to achieve good or high ecological status. The most common reasons for rivers and streams achieving moderate, poor or bad ecological status are changes in hydromorphology (e.g. as a result of technical structures, river straightening and regular maintenance), lack of ecological continuity and high inputs of pollutants, nutrients and fine sediments. These impairments are reflected in significant changes in natural aquatic communities. Nutrient input is the most common reason for lakes, transitional and coastal waters failing to achieve the target. In 2021, however, fewer water bodies were rated as having bad status and more achieved good, moderate or poor status than in 2015.

Ecological status of surface waters



Alt-Text:

The diagram shows the ecological status of waters expressed as a percentage. The target value of 100% was to be achieved by 2021. Standing at 9% in 2021, the value is still far from the target range.

Thematic areas

B 1.2.2 Coastlines and oceans, B 1.2.3 Lakes, ponds, pools and lagoons; B 1.2.4 Rivers and floodplains; C 4 Water protection and flood prevention

Definition

Proportion of surface water bodies – sections of rivers, streams, lakes, transitional and coastal waters – with good or high ecological status as a percentage of all water bodies assessed

Target

100% of the water bodies achieve good or high ecological status by 2021.

Core assessment

Only 9% of water bodies achieved good or high ecological status in 2021. The most common causes of impairment are changes in the structure of water bodies and high nutrient inputs from diffuse sources, such as agriculture and rainwater from settlements.

2.1.7. Status of floodplains

Rivers and their floodplains are of great importance in biodiversity conservation. They provide habitats for numerous species that are adapted to the specific conditions – particularly flooding regimes and the water supply – and often serve as ecological corridors of transregional importance. Floodplains are also important as flood retention areas that help to prevent flood damage. Both aspects – biodiversity conservation along rivers and flood risk management – are thus integral to action area C4 “Water protection and flood prevention” for the National Strategy on Biological Diversity.

Based on the outcomes of several research projects, a status report on Germany’s major river floodplains (Auenzustandsbericht) was published in 2009 (BMU & BfN 2009). This was the first publication to present the status of Germany’s river floodplains. The data can be used to review the targets outlined in the National Strategy on Biological Diversity for improvements in the status of floodplains. These include the aim of preserving the function of watercourses and floodplains as habitats to ensure a diversity of organisms and habitats characteristic of Germany’s physiographic regions by 2020. Likewise by 2020, measures are to be taken to ensure that a majority of watercourses have more natural inundation areas than they do today (at least a 10% enlargement of river floodplain retention areas). The Status Report on German Floodplains published in 2021 was the second nationwide assessment since 2009 on the size, use and status of major river floodplains in Germany (BMU & BfN 2021). It further developed and updated the data available on floodplain status.

[Margin column: The indicator provides information on the status of floodplains as a habitat for plants and animals.]

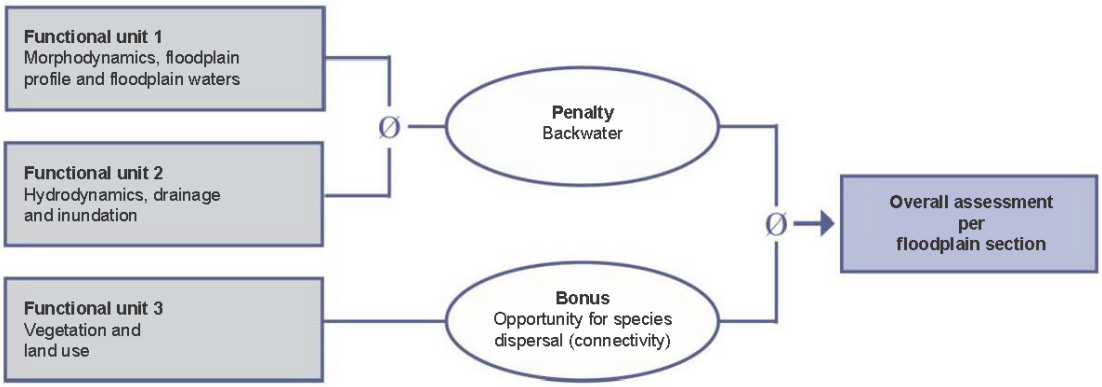
Indicator

The indicator is calculated as an index value reflecting the condition of all river floodplains in the Status Report on German Floodplains. The status of floodplains provides an overview of local morphological and hydrological conditions and the use of floodplains. These factors are key determinants of habitat quality for plants and animals in floodplains.

Based on the findings of the Status Report on German Floodplains, a quantitative target for the indicator is an improvement of 10 percentage points in the status of floodplains nationwide for by 2020 relative to the 2009 indicator value.

Composition

The second Status Report on German Floodplains was published in 2021. The reports survey the parts of river floodplains that can be inundated, starting at the point of each individual river where the catchment exceeds 1,000 km^2. Tidal areas are not included. The survey area thus covers the larger floodplains of a total of 79 rivers (10,276 kilometres of river and a total floodplain area of 16,185 km^2 in 2021), divided into the main catchments of the Rhine, Elbe, Danube, Weser, Ems, Oder and Maas along with other rivers flowing directly into the North Sea and Baltic Sea. The floodplain status is assessed separately for the right and left side of the river for 1-km-long sections. Three key functional aspects of floodplains are considered: floodplain relief, discharge dynamics and distribution of vegetation and land use (see diagram below).



The assessment of the main functions incorporates a wide range of floodplain-related parameters from various nationally available data sources, particularly water body structure data and land use data from the Digital Landscape Model (DLM25).

The floodplain status assessment distinguishes five status categories ranging from “very slightly modified” (category 1) to “very severely modified” (category 5). The assessment is based on the national floodplain typology developed by Koenzen (2005). As with assessments under the European Water Framework Directive, it relates to a reference condition free of human influence. In the case of floodplains, this is referred to as the “potential natural status”. The index calculation is based on a progressive weighting of the status categories. The value of the index theoretically ranges from 0% (all floodplains are very severely modified) to 100% (all floodplains are only very slightly modified).

Table: Weighting for floodplain status categories (Source: Ackermann et al. 2013)

Floodplain status		Weighting
1	Very slightly modified	16
2	Slightly modified	8
3	Significantly modified	4
4	Severely modified	2
5	Very severely modified	0

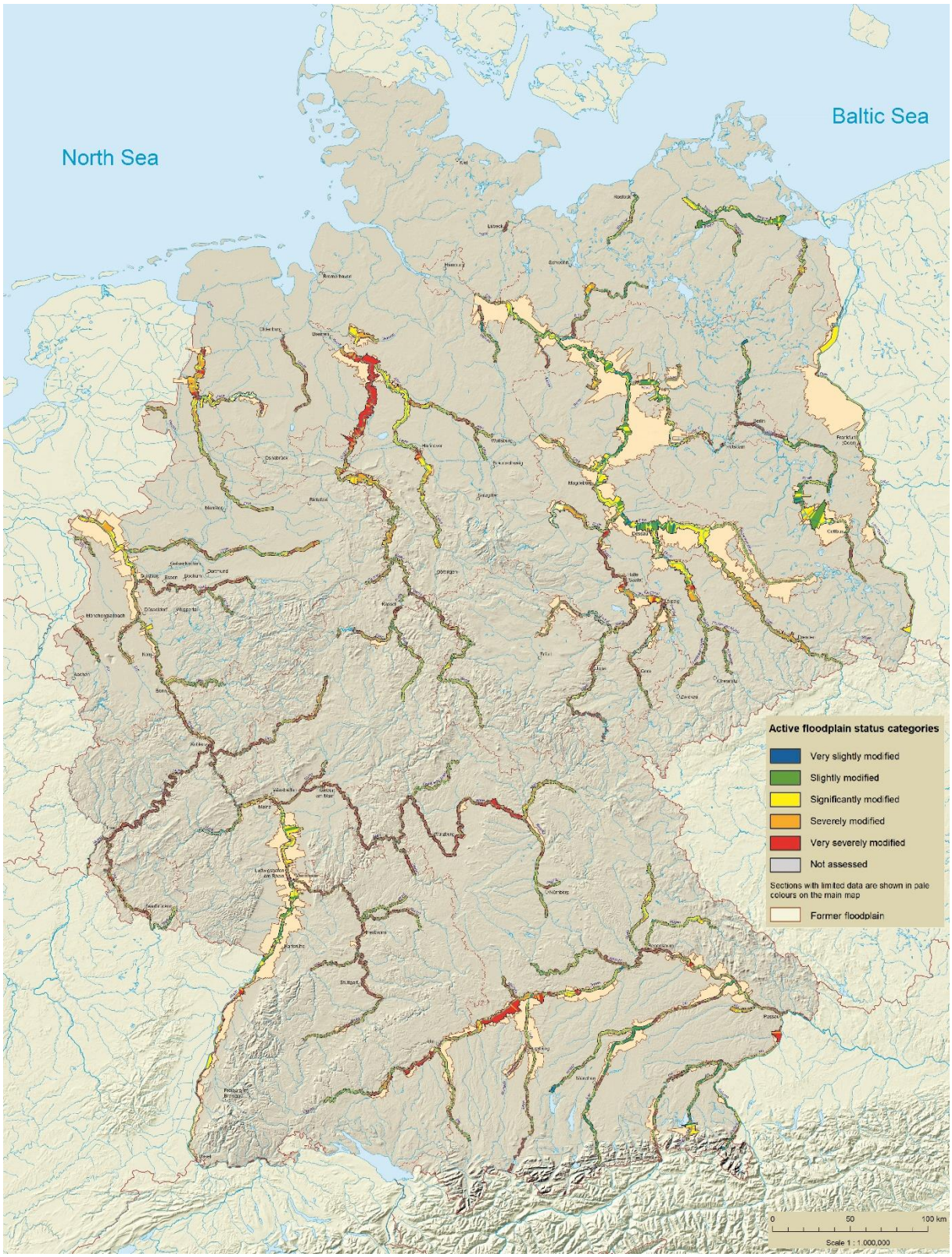
[Margin column: "By 2020, watercourses and their water meadows will be protected in their role as habitats, and the typical diversity of the natural area in Germany will be guaranteed. [...] By 2020, the majority of watercourses have more natural flood plains." (BMU 2007: 35)]

Assessment

Compared with the indicator for 2009, the index value for 2021 is lower by 1.5 percentage points and stands at just over 17%. The target of 29% for 2020 was not achieved. The deterioration in the indicator value is largely attributed to methodological changes and new datasets on inundation areas. Along 52 rivers, the active floodplains have increased in size compared to 2009. This means that less frequently inundated and thus more intensively used areas were also assessed. This tends to result in a lower floodplain status assessment. The indicator value reflects the still severe floodplain impairment overall. The main reasons for the poor condition of floodplains in Germany are intensive use of floodplains, severe restriction of floodable areas, extensive river engineering and the effects of impoundment. However, restoration measures lead to localised improvements in floodplain status and to the reactivation of natural floodable areas. In the past 25 years, 170 floodplain restoration projects have been implemented along rivers and approximately 5,500 ha of floodplains along 22 rivers were reclaimed between 1996 and 2017, representing a gain of about 1% (BMUB & BfN 2015, Ehlert & Natho 2017). The reclamation of natural inundation areas is also reported as an indicator in the biodiversity action area in the German Strategy for Adaptation to Climate Change and shows a slight positive trend (UBA 2019). As highlighted by the results of the 2021 Status Report on German Floodplains, the measures implemented so far are nowhere near enough to achieve significant improvements on a national scale and thus bring about an increase in the indicator value. As a result, to protect and develop biodiversity in river floodplains, a very large effort with more and larger-scale measures will continue to be necessary. A paradigm shift towards near-natural floodplain

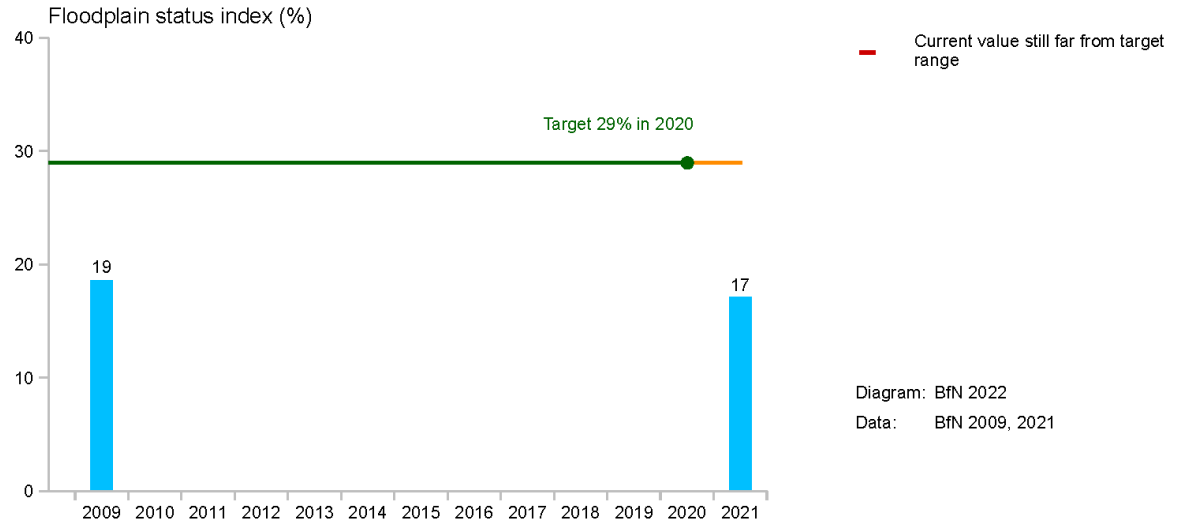
development has already been initiated by the Federal Government under Germany's Blue Belt programme, which aims to restore federal waterways and their floodplains to create a biotope network of national importance. In the future, the programme will support more and, above all, large-scale restoration projects on rivers and their floodplains.

Figure: Status of floodplains in Germany in 2021



Source: Bundesamt für Naturschutz (BfN), 2021

Floodplain status



Alt-Text:

The diagram shows the status of floodplains. The target value of 29% was to be achieved in 2020. The indicator stood at 17% in 2021. The current value is still far from the target range.

Thematic areas

B 1.2.4 Rivers and floodplains, C 4 Water protection and flood prevention

Definition

Index (measured as a percentage) on the floodplain status assessments of all major river floodplains in Germany covered in the Status Report on German Floodplains

Target

10 percentage point improvement in the status of floodplains nationwide by 2020 compared with the 2009 indicator value (increase to 29%)

Core assessment

Overall, the major German river floodplains are severely modified (indicator value 17% in 2021). As a result, considerable effort with more and larger-scale measures will continue to be necessary to protect and develop biodiversity in river floodplains.

2.2 Settlements and transport infrastructure

2.2.1. Increase in land used for settlement and transport infrastructure

Land is a finite and valuable resource. In addition to nature conservation, there are many competing uses for land. These include agriculture and forestry, settlements and transport infrastructure, resource extraction and energy production – and in particular the area of land used for settlements and transport infrastructure is steadily increasing. Undeveloped land is needed to safeguard ecological services, for biodiversity conservation and recreation, both in the countryside and in green urban spaces. The direct environmental impacts of the increasing amount of land used for settlements and transport infrastructure include the loss of ecological soil functions caused by surface sealing, the loss of fertile farmland and the loss of near-natural land with its biodiversity. The steady decline in agricultural land reduces the potential contribution farming can make to food production, thus leading to more intensive use of the remaining land.

The “Increase in land used for settlements and transport infrastructure” indicator was selected as a key sustainability indicator for land use under Germany’s National Sustainable Development Strategy and incorporated into the National Strategy on Biological Diversity. It is thus regularly included in the Indicator Reports for Germany’s National Sustainable Development Strategy, most recently in the 2021 Indicator Report (Statistisches Bundesamt 2021a).

[Margin column: The indicator provides information on impairments to biodiversity from the increase in land used for settlements and transport infrastructure.]

Indicator

The indicator represents the average increase in amount of land used for settlements and transport infrastructure in Germany, measured in hectares per day. Settlements include land for housing, industry and commerce, public institutions, sport, leisure and recreation and cemeteries. Transport infrastructure comprises four sub-types: infrastructure for road, rail, air and maritime transport. The indicator therefore takes into account not only sealed land, but also land that is undeveloped and unsealed, including areas such as private gardens, parks and green spaces. According to calculations in the eco-environmental assessments conducted by the Länder, the proportion of sealed land in land used for settlements and transport infrastructure in the various Länder is estimated at an average of 45% (Gemeinsames Statistikportal 2022).

When adopting the National Sustainability Strategy in 2002, the Federal Government followed the recommendation of the German Council for Sustainable Development in setting a national target for new land use for settlements and transport infrastructure of an average daily maximum of 30 ha by 2020. In the latest version of the German Sustainable Development Strategy published in 2016, the daily conversion of new land used for settlements and transport infrastructure must be reduced to under 30 hectares per day by 2030. In the revision of the 2021 German Sustainable Development Strategy, the Federal Government – in accordance with the EU Roadmap to a Resource Efficient Europe and the German Climate Action Plan 2050 – introduced the additional, long-term target of achieving circular-flow land-use management (net zero land conversion) by 2050 (Bundesregierung 2021a). Changes in the indicator show whether it has already been possible to limit the spread of land used for settlements and transport infrastructure at the expense of more near-natural habitats.

[Margin column: According the German Sustainable Development Strategy, use of new land for settlements and transport infrastructure is to be reduced nationwide to an average of less than 30 ha per day by 2030 (Bundesregierung 2017).]

Composition

The indicator covers land used for:

- Housing, industry and commerce (excluding land for resource extraction), public facilities
- Area for sport, leisure and recreation, cemeteries
- Transport infrastructure

Up to and including 2015, the underlying data was provided by automated land registers on settlements and transport infrastructure. These are analysed by the statistical offices of the Länder and complied by the Federal Statistical Office (Statistisches Bundesamt 2022a). To obtain a meaningful indicator value, the increase in land used for settlements and transport infrastructure is calculated for each reported year as an average in hectares per day.

Certain areas have been reclassified in the land registers in recent years, which were not based on any real changes in use. To compensate for any resulting effects (especially statistical artefacts), a four-year rolling average is used (shown as a curve), which is calculated on the basis of the current reporting year and the three preceding years.

Assessment

In the past two decades, the growth in the land used for settlements and transport infrastructure has slowed down with a discernible trend. While the four-year rolling average still stood at 129 ha per day in 2000, it had dropped to 52 ha per day by 2019 – albeit with a slight increase to 54 ha per day again in 2020.

As of 31 December 2021, land used for settlements and transport infrastructure stood at 14.5% of German land area, comprising 9.4% settlements (including mining, open-cast mining, pits and quarries) and 5.1% transport infrastructure. In the past 28 years, the land used for settlements and transport infrastructure has risen by 28%. This includes a 34.9% increase since 1992 in land used for settlements and of 9.9% for transport infrastructure. The proportion of land used for housing in settlements and transport infrastructure amounts to approximately 27% and the proportion for transport infrastructure to approximately 35%. The area accounted for by housing increased by approximately 24% between 2004 (11,295 km²) and 2021 (14,053 km²), while the population only rose by just under 0.1% in the same period (and even declined at times).

The increase in housing is partly due to the fact that parents often remain in large homes after their children have moved out (remanence effect) and partly due to younger people living in single-person households or in couples without children for longer periods of time, thus occupying more living space per capita than family households. Some households also benefit from higher incomes, which enable them to live in larger and more upscale homes. Depending on household composition, living space in homes increased to 46 m² per inhabitant in 2018 (Statistisches Bundesamt 2020). According to the German Economic Institute (Institut der Deutschen Wirtschaft, IDW), living space per inhabitant amounted to just under 49 m^2 on average, which is three square metres more than in 2010 and seven more than in 2000 (IWD 2020).

Compared with 2019, the land used for transport infrastructure increased by a slight 0.1% in 2020, while the share used for roads declined slightly by 0.1%. In the past 20 years (1991 to 2019), total vehicle kilometres driven on German roads have increased by approximately 31.5%. In the same period, mileage in passenger transport increased by 29% and in goods transport by 69%.

Keeping the indicator trend at a level equal to the average annual trend of recent years would not be enough to achieve the target in the revised German Sustainable Development Strategy of reducing the increase in new land use for settlements and transport infrastructure to a maximum of 30 ha per day by 2030. This means that existing instruments and measures to reduce land take need to be rigorously applied, updated and supplemented with new instruments. For example, settlement development should focus more on the

reuse of former industrial and other abandoned sites. In such cases, the guiding vision is a dual approach to urban development, combining urban densification with an improvement in the quality and quantity of green elements and open spaces. In general, the most diverse possible solutions for multiple uses of space should be sought. Action is also necessary to raise public awareness of the need to limit the increase in new land used for settlements.

In the context of the necessary further development of the federal transport infrastructure, the Federal Transport Infrastructure Plan (BVWP) 2030 – the central steering instrument adopted in 2016 – looked at how to limit additional land use, avoid the further loss of undissected low-traffic areas and maintain the structural fabric (see also the section on landscape dissection). For the first time, the plan was subject to a strategic environmental assessment (SEA), which also included land as a protected resource. A review of the requirements provided for in infrastructure development legislation will be conducted in 2023.

[Margin column: Targets adopted by the Federal Government with regard to the increase in land used for settlements and transport infrastructure include (BMU 2007: 51):

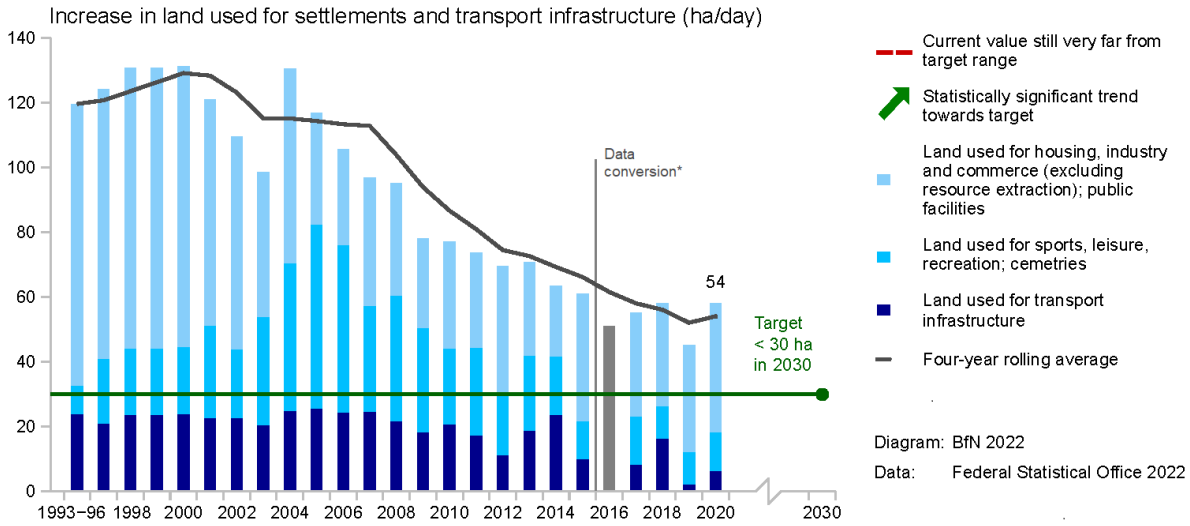
"To guide land use in favour of restoring usability, increasing the density of use, and other urban development measures,

To transform the economic and fiscal framework conditions to encourage the sparing use of land and the activation of derelict and contaminated sites,

To consistently apply the existing planning mechanisms to minimise land use and, where applicable, to update the relevant planning instruments […]

To intensify inter-community cooperation in the designation of sites for residential and commercial areas on the basis of existing pilot projects, with immediate effect".]

Increase in land used for settlements and transport infrastructure



* The analysis of land used for settlements and transport infrastructure is based on official area statistics. From the 2016 reporting year, these have been based on the Authoritative Real Estate Cadastre Information System (ALKIS). This hinders a comparison with previous years and makes it difficult to calculate changes. The land used for settlements and transport infrastructure determined after the data conversion contains largely the same types of land use as before 2016. It was not possible to divide the data into the three land use groups shown in the diagram for 2016.

Alt-Text:

The diagram shows land used for settlements and transport infrastructure in ha per day. The four-year rolling average fell from 129 ha per day in 2000 to 52 ha per day in 2019, but for the first time in a long time, a slight increase was seen to 54 ha per day in 2020. The target to be achieved is less than 30 hectares per day in 2030.

Thematic areas

B 2.7 Land used for settlements and transport infrastructure, C 9 Settlements and transport

Definition

Average increase in land used for settlement and transport infrastructure in ha per day (four-year rolling average)

Target

The increase in new land used for settlements and transport infrastructure is to be reduced to an average of less than 30 ha per day by 2030.

Core assessment

At 54 ha per day, the four-year rolling average has been on the decline since 2000, but it is still very far from the target of below 30 ha per day. This means that existing instruments and measures to reduce land take need to be rigorously applied, updated and supplemented with new instruments.

2.2.2. Landscape dissection

Linear infrastructure elements impair landscape quality and thus its suitability for recreational use due to disturbances and emission corridors (especially noise and pollutants). They also separate human and animal habitats on account of transport corridors that are difficult to cross. The goal of maintaining undissected low-traffic areas originally stems from recreational planning. When analysing the dissection of the landscape, roads, railway lines and canals are considered to be important parts of transport networks. Undissected, low-traffic areas are defined as areas of at least 100 km^2 in size that are not dissected by transport networks. Transport routes are only deemed to dissect the landscape if they exceed a certain traffic volume.

The concept of undissected low-traffic areas provides a very good quantitative measure of large-scale landscape dissection. It does not, however, allow nuanced conclusions about the function, quality and dissection of individual habitats within identified undissected low-traffic areas. As such areas are located in less populated landscapes with less transport infrastructure, when compared to highly dissected areas they are affected to a lesser extent by continuous traffic-related emissions such as noise. They can also be an indication of a more near-natural state. The absence of dissection and traffic-related disturbances is essential for the presence of many species and for biodiversity conservation.

[Margin column: The indicator represents the extent of dissection in relation to the total area of the landscape.]

Indicator

The indicator measures the degree of landscape dissection in Germany by transport networks at landscape scale (1:250,000). There are two approaches to calculating landscape dissection that are used for two different sub-indicators. The first sub-indicator represents the total of undissected, low-traffic areas with a minimum size of 100 km^2 as a percentage of Germany's total land area. The second sub-indicator shows the effective mesh size (M_{eff}), which is a measure of the average degree of landscape dissection expressed as the mesh size of an imaginary regular grid that exhibits the same degree of dissection as the real transport axes in a surveyed area. M_{eff} is suitable for describing the condition of heavily fragmented landscapes and showing gradual changes in the degree of dissection of already heavily fragmented landscapes.

In the National Strategy on Biological Diversity, the Federal Government has set the target of maintaining the current proportion of undissected, low-traffic areas (≥ 100 km^2). As no value is available for 2007 when the strategy was adopted, the value for 2005 (25.4%) is used for the target instead.

[Margin column: "The current proportion of undissected, low-traffic areas of ≥ 100 km² will be retained." (BMU 2007: 52)]

Composition

Data on transport routes is taken from the national Digital Landscape Model (DLM 250). In addition, traffic census data from the Federal Highway Research Institute (BASt) and the Länder was supplemented by model-based traffic volumes for the entire road network in the 2010 survey. Dissecting transport axes are defined as roads (federal motorways, federal roads, state roads and district roads) with traffic volumes upwards of 1,000 motor vehicles per day, multiple-track or electrified single-track railway lines and German federal waterways (Class IV or higher). The analysis looks at the dissection of the German land surface by these transport axes. Settlements and airports with an area of more than 93 ha are also treated as dissecting barriers. As a result, the location, number and total area of all areas that constitute undissected low-traffic areas of at least 100 km² in size can be determined.

Assessment

Four indicator values are available for the years 2000, 2005, 2010 and 2015. The assessment shows that in 2015, the percentage of undissected low-traffic areas in Germany is within the target range and increased slightly from 23.2% in 2010 to 23.5%. However, it still remains below the target value of 25.4%. The increase in undissected low-traffic areas in 2015 is largely due to changes in the methodology, as the modelled traffic volumes on state and county roads frequently vary around the threshold of 1,000 vehicles per day. The effective mesh size (M_{eff}) decreased in 2015 to 80 km² and shows that further dissection has occurred, most notably in low-traffic areas of at least 100 km². The loss of undissected low-traffic areas from 2010 is largely a result of a change in the underlying data. Due to changes in the dissection criteria and the different data used for traffic volumes in 2000, 2005 and 2010/2015, the values in the time series are only comparable to a limited extent. The indicator values for 2015 are, however, fully comparable with the values from 2010, as they are based on the same dissection criteria and also on complete traffic volume data (projections).

Germany has well-developed transport infrastructure so that the focus of future investments will be on maintaining the existing infrastructure. The current Federal Transport Infrastructure Plan 2030 has for the first time focused on limiting new land take and avoiding further loss of undissected areas in order to limit the use of nature and the landscape.

For the conservation of biodiversity, it is essential to avoid further fragmentation of ecological networks[3] and to remove existing fragmentation. Ensuring sufficient ecological passability is already standard practice when building and upgrading federal transport routes. Wildlife crossings in the form of bridges and tunnels are generally provided where there is a proven need.

Neither of the current sub-indicators (undissected low-traffic areas and M_{eff}) can take individual wildlife crossings into account, as they consider transport routes as a whole. The Federal Government's many efforts to avoid fragmentation or to reconnect the landscape are therefore not adequately reflected. An additional sub-indicator is needed as a result. This sub-indicator should cover the BfN's ecologically derived habitat networks and corridors and the undissected functional areas; thus, unlike with the first two sub-indicators, it would then be possible to include the ecological quality of the areas in the assessment.

[Margin column: In action area C9, "Human settlements and transport", the German Federal Government committed to a wide range of measures (BMU 2007), including:

Anchoring of the concepts "Undissected low-traffic areas" and "habitat corridors" together with noise abatement in strategic environmental assessment for traffic route plans

Development of nature conservation standards to assess considerable impairments to biodiversity via effect factors, particularly transport route planning

Development of a nationwide concept to protect and restore undissected low-traffic areas

Conservation/restoration of connecting corridors to reduce the effects of dissection and to strengthen the network function

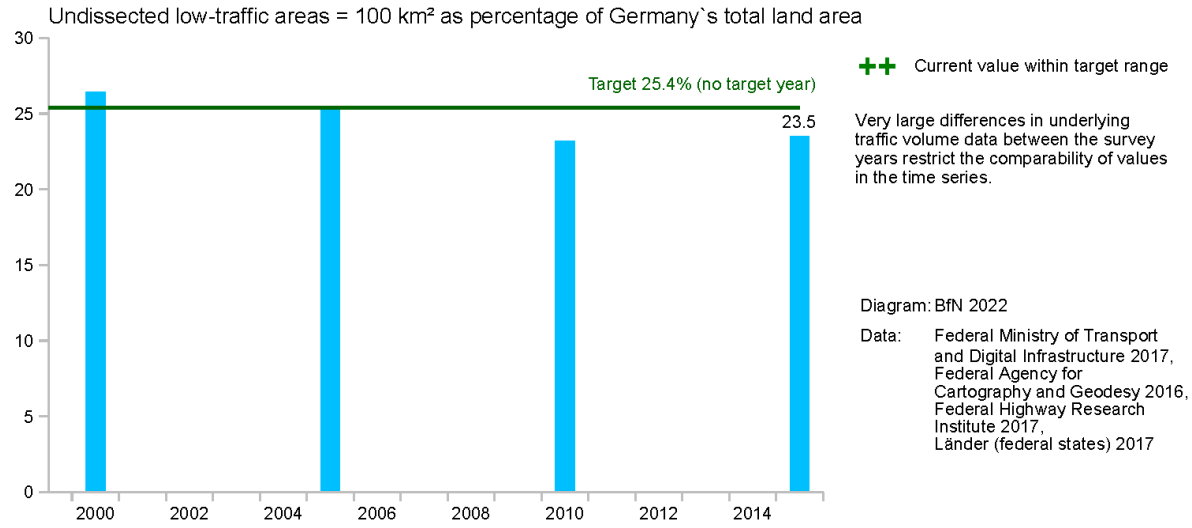
Consideration of interlinked habitat axes in national transport route planning projects

Development of a nationwide programme of measures on the topic of dissection/cross-linking

Continued development of the indicator "undissected low-traffic areas" with due regard for European developments and regular documentation every 5 years]

[3] Ecological networks (also known as habitat networks) are systems of similar, adjacent habitats of high conservation value that potentially have close functional links.

Landscape dissection



Alt-Text:

The diagram shows landscape dissection as a percentage. The value for 2015 was 23.5%. The target of 25.4% is shown without a target year. The current value is within the target range.

Thematic areas

B 2.8 Mobility, C 9 Settlements and transport

Definition

Percentage of Germany's land area accounted for by undissected low-traffic areas with a minimum size of 100 km^2

Target

The percentage of undissected low-traffic areas with a minimum size of 100 km^2 is the same as in 2005 (25.4%).

Core assessment

The percentage of undissected low-traffic areas with a minimum size of 100 km^2 decreased from 26.5% to 23.5% between 2000 and 2015. In the same period, the effective mesh size (M_{eff}) decreased from 84 km^2 to 80 km^2. Germany has well-developed transport infrastructure so that the focus of future investments will be on maintaining the existing infrastructure.

2.3 Economic uses

2.3.1 Agri-environment-climate measures (AECMs)

Farmland offers habitats for numerous animal and plant species living in the open countryside. This requires forms of land use that meet the needs of these species. Many species that depend on low-intensity forms of agriculture have undergone sharp population declines, on the one hand due to the intensification of agriculture – which varies from region to region – and on the other hand due to under- and disuse of farmland, especially on marginal land.

Under the second pillar of the Common Agricultural Policy (CAP), the European Union provides funding from the European Agricultural Fund for Rural Development (EAFRD) to support, among other things, agri-environment-climate measures[4] (AECMs; called agri-environment measures/AEMs until 2013). These measures aim, among other things, to preserve and promote biodiversity, to protect the soil and improve soil structure, to reduce emissions and fertiliser and pesticide inputs as a contribution to environmental protection, climate change mitigation and adaptation and to improve animal welfare.

In Germany, planning and management of these measures is the responsibility of the Länder. Under the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK), the federal government can co-finance 60% of individual measures. The requirements for AECMs must go beyond the mandatory requirements for area-based and head-of-livestock-based agricultural payments in the reporting period, i.e. beyond the cross-compliance provisions (mandatory statutory management requirements (SMRs) and maintenance of land in good agricultural and environmental condition), greening requirements (maintenance of permanent pasture, crop diversification and establishment of organic priority areas) and mandatory minimum requirements under national legislation. Payments for these funding measures may only compensate for the additional costs and loss of income that go beyond the farm management requirements prescribed elsewhere. Duplication of subsidies must be avoided.

Through the European Agricultural Fund for Rural Development (EAFRD), funding can also be granted for AECMs to preserve genetic resources, i.e. locally endangered animal breeds and regionally adapted traditional crop species and varieties threatened by genetic erosion. However, additional measures to conserve and improve biodiversity, such as Natura 2000

[4] Climate measures seek to mitigate climate change and help adapt to its impacts.

compensation payments and support for non-productive investments to preserve and enhance rural heritage, are counted separately. Up to now, estimating the funds explicitly used for biodiversity has been very difficult and is only possible to a limited extent even if only AECMs are analysed: the measures often pursue multiple goals, with biodiversity conservation targeted alongside environmental protection (such as soil conservation) and/or climate change mitigation and adaptation. For this reason, the indicator so far includes all AECMs, with no account taken of actual biodiversity relevance. It remains to be seen, however, whether the provisions governing the new CAP funding period from 2023 make it easier to identify such measures separately.

[Margin column: The indicator provides information about subsidies for agri-environment and agri-environment-climate measures in agriculture.]

[Margin column: Financial resources for agri-environment-climate measures are intended to promote traditional and environmentally sound forms of agriculture that sustain nature (BMU 2007: 73).]

Indicator

The indicator represents the total area of land on which agri-environment measures and, starting in 2014 agri-environment-climate measures, have been carried out and the amount of funding granted for this purpose. Conserving and enhancing biodiversity in the cultivated landscape is a fundamental aim of agri-environment programmes and an objective of the National Strategy on Biological Diversity (NBS). Increasing the scope of AECMs (area and funding) is thus a suitable means of advancing the objectives under the NBS.

Composition

Data related to the land on which AECMs are funded, as well as data on EU, national and Länder subsidies granted for this purpose is compiled by the Federal Ministry of Food and Agriculture (BMEL). Since 2007, in accordance with EU requirements, the Länder have reported the amount of the actual payments rather than the funding made available as in previous funding periods.

For the funding period starting in 2014, no consolidated data on AECMs is available for the years 2014 and 2015. Due to changes in EAFRD reporting obligations, this data cannot be evaluated by the BMEL on the basis of the reports published by the Länder. 2014 and 2015 were the transition years between the CAP funding phases. In these years, it was not feasible to carry out a survey with a reasonable amount of effort, as comparable data was not collected and reported by the Länder and the transition to the new funding phase, i.e. eliminating the old obligations, took place at a different time in each of the Länder and may have even been different for different measures. To

obtain the figures for 2016 and 2017, the Federal Office for Agriculture and Food (BLE) conducted a data survey of the Länder. As a result, the data from 2016 onwards is only comparable with previous years to a limited extent.

Assessment

In the funding period from 2014 onwards, the total area funded declined considerably. One reason is that various measures covering a large area but with a comparatively low level of effectiveness were no longer offered by the Federal Government and Länder governments (for example, over 1 million ha of crop rotation measures and measures to promote the application of liquid manure have ended). At the same time, funding for more ambitious measures was better aligned with the actual costs (e.g. an increase in funding for the introduction and continuation of organic farming). Overall, funding for AECMs significantly increased.

In addition, following the amendment to the act regulating the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK) in 2016, biodiversity conservation measures were successively added to the GAK framework plans of subsequent years (including under the funding principles “non-productive investment nature conservation” and “contract-based nature conservation”). The GAK special framework plan “Measures to promote insect protection in agricultural landscapes” introduced in 2020 will be continued under the special framework plan “Measures for organic farming and biodiversity” in 2023.

As a general rule, fluctuations in funding activity are determined to a large extent by the funding periods of EU agricultural funding. Experience shows that commitments decline both at the beginning and towards the end of a funding phase and increase in the period in between. At the beginning of a new funding phase, other requirements for farms and administrations are often at the forefront – in 2014, it was the introduction of greening – so that new AECMs are thus not initially agreed. Agri-environment measures also need to be adapted to the new legal provisions and needs at the beginning of a new funding phase.

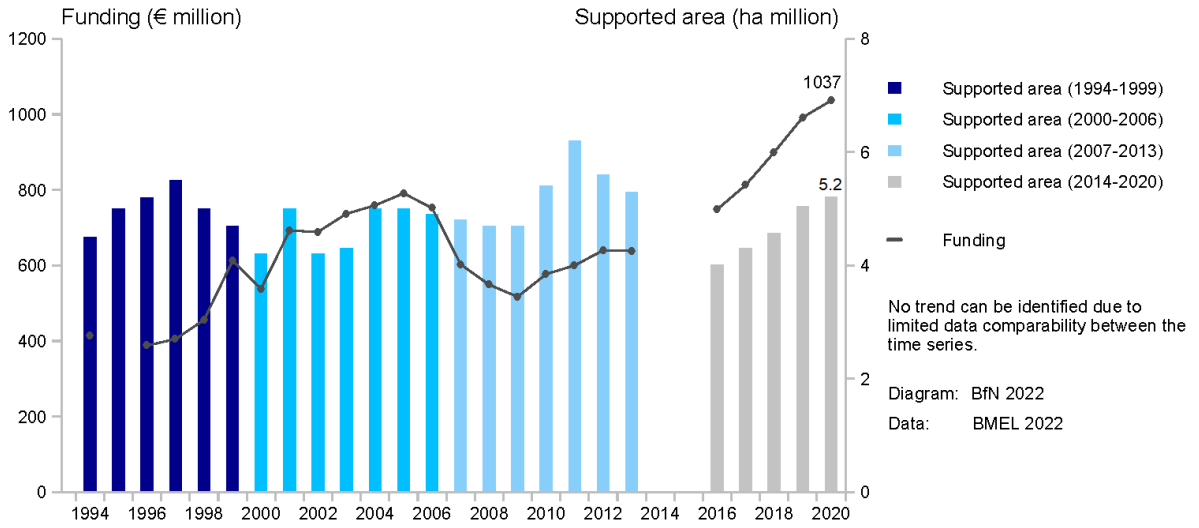
Looking at the distribution of EAFRD funds in Germany and the funds for national co-financing for the period 2014 to 2022, AECMs accounted for the most significant share of around 20% of the total funding. The most recent data for 2020 shows that AECMs received funding amounting to 1.3 billion euros on 5.2 million ha of agricultural land. To maintain or enhance biodiversity in the agricultural landscape, adequate availability and use of funding also play an important role in national implementation of Common Agricultural Policy (CAP).

[Margin column: The National Strategy on Biological Diversity identifies the following measures for implementation in agriculture and forestry (BMU 2007: 73):

At EU/national level: "Review of agricultural and environmental policy measures with a view to sustainability and financially viable opportunities to further improve nature compatibility within the context of EU agricultural support and national/European agricultural and environmental policy"

At Land/local government level: "More widespread promotion of traditional and eco- and nature-friendly forms of agriculture and forestry"]

Agri-environment-climate measures



Alt-Text:

The diagram shows the total areas of land on which agri-environment-climate measures have been implemented, together with the amount of funding provided for this purpose.

Thematic areas

B 2.4 Agriculture, C 6 Agriculture and silviculture

Definition

Area of land on which agri-environment measures (from 2014 agri-environment-climate measures (AECMs)) have been implemented and the amount of funding granted

Qualitative target

Promotion of traditional as well as environmentally- and nature-friendly forms of agriculture with the goal of significantly enhancing biodiversity in the agricultural landscape

Core assessment

In the 2014 to 2022 funding period, the significantly increased funding was concentrated on far fewer funded areas from 2016 onwards. This was due to cost-intensive measures that are considered to have the greatest positive impact on the agricultural environment.

2.3.2 Organic farming

Some 51% of Germany's area is agricultural land. Farmland biodiversity depends to a large extent on which farming methods are used. Improvements in species and habitat conservation in the agricultural landscape can only be achieved with more eco-friendly, nature-compatible farming practices.

Organic farming makes a valuable contribution to conserving biodiversity and promoting regionally typical cultivated landscapes. The aim of organic farming is farming methods with optimised nutrient cycles and livestock raised on land appropriate to the species in order to conserve energy and raw material sources, avoid negative environmental and climate impacts and reduce the input of nutrients into water bodies and soils. Among other things, organic farming increases biological activity in the soil, protects soil structure and reduces soil erosion. The increased capacity of the soil to retain water additionally helps to mitigate flooding and drought events. Through the build-up of humus, carbon is captured in the soil, thereby contributing to natural change mitigation. Reducing the use of veterinary medicinal products and eliminating the use of easily soluble mineral fertilisers and synthetic chemical pesticides helps protect biodiversity, groundwater and surface waters. The Federal Government thus sees organic farming as essential in achieving its agricultural policy vision.

The indicator for organic farming was developed for the National Sustainability Strategy and incorporated into the National Strategy on Biological Diversity. It is thus regularly included in the Indicator Reports for Germany's National Sustainable Development Strategy, most recently in the 2021 Indicator Report (Statistisches Bundesamt 2021a). The indicator is also assessed in the indicator set developed by the Länder Initiative for a Core Set of Indicators (LiKi, Länderinitiative Kernindikatoren).

[Margin column: The indicator provides information about the area of organically farmed land that contributes to biodiversity conservation.]

Indicator

The indicator for organic farming provides information on the amount of organically farmed land belonging to farms subject to the inspection procedure in accordance with EU legislation for organic farming. It is calculated as a percentage of the total agricultural land and includes both land fully converted to organic farming and land still in the process of conversion.

In the coalition agreement for the 20th legislative period, the Federal Government set the goal of further expanding organic farming to 30% by 2030. With its policy decision on the German Sustainable Development Strategy of 30 November 2022, the Federal Cabinet reaffirmed this goal. This was also done with a view to the EU's 25% organic farming target for 2030 set out in the European Commission's Farm to Fork strategy.

Composition

The indicator is calculated from data provided by the Federal Statistical Office. The data is based on the results of agricultural statistical surveys. The reference value for calculating the percentages is the area used for agriculture that is determined annually as part of the main land use survey (Bodennutzungshaupterhebung). It includes both land fully converted to organic farming and land still in the process of conversion. The data mostly relates to the month of May of the respective year. Survey limits are used to exempt small farms from the obligation to provide data and to minimise the effort involved in collecting data.

Until the end of 2021, land was considered organically farmed if a farm produced plant or animal products in accordance with the principles of Council Regulation (EC) No 834/2007 on organic production and labelling of organic products and the associated implementing rules. On 1 January 2022, Regulation (EU) 2018/848 on organic production and labelling of organic products entered into force, repealing Council Regulation (EC) No 834/2007.

Assessment

In 1999, according to official statistics, organic farming was practised on 489,093 ha of land by 9,572 farms. This represented 2.9% of the total land used for agriculture. These figures have risen continuously since 1999. In 2020, organic farming was practised on around 1.6 million ha (Statistisches Bundesamt 2021b). This represented 9.6% of the total land used for agriculture. Organic farms number nearly 26,100. For methodological reasons, the alternative annual data provided by the Federal Ministry of Food and Agriculture indicated a slightly larger share of 10.25% or 1.7 million ha for 2020. In 2020, most of the organically farmed land in Germany was used as permanent grassland (52.4%), arable land accounted for 46% and other crops (including fruit) for only 1.5%. From 2007 to 2020, a statistically significant positive trend was evident and the increase in area in 2017 and 2020 was

much higher than in previous years. Nonetheless, the current indicator value is still very far from the target value.

Demand for organic products continues to rise. In 2020, sales of organic products in Germany stood at 14.99 billion euros (2021: 15.87 billion euros; 2022: 15.31 billion euros (Branchenreporte Bund Ökologische Lebensmittelwirtschaft e. V.). The share of sales of organic products in the total food market stood at 6.4% in 2020 and at approximately 7% in 2021.

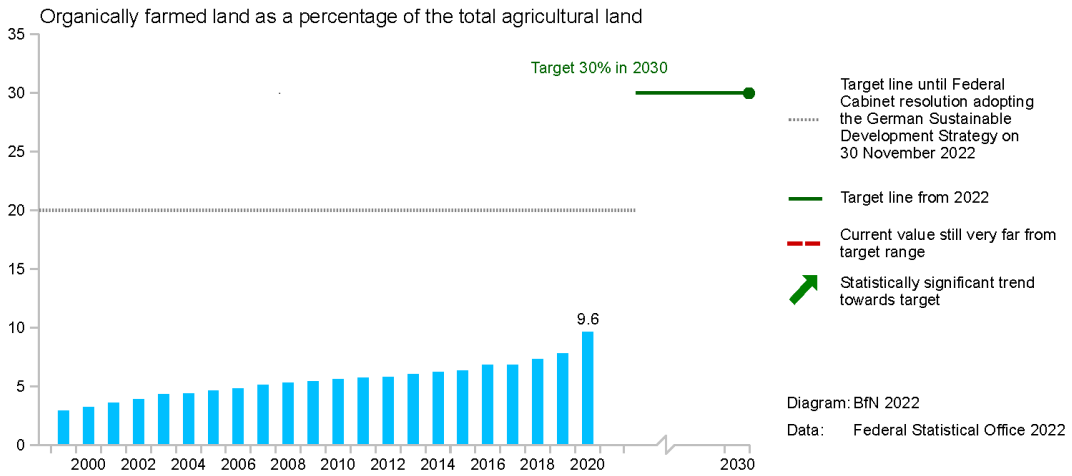
The Federal Government is committed to further expanding organic farming and to giving incentives for interested farmers to switch to and continue organic farming. As a result, most GAK payments for switching to and continuing organic farming were increased from 2015. Under the GAK special framework plan on “Measures to promote insect protection in agricultural landscapes”, additional funding was made available for organic farming from 2020. The GAK special framework plan will be continued in 2023 under the special framework plan on “Measures for organic farming and biodiversity”.

Since 2001, the Federal Ministry of Food and Agriculture (BMEL) has been funding research projects as well as information, education and sales promotion measures on organic farming and organic food production as part of the Federal Scheme for Organic Farming (BÖL). For 2022, the scheme budget was increased by 3.4 million euros, resulting in an annual available budget of 35.94 million euros for targeted funding measures.

The BMEL’s Organic Farming Strategy for the Future (Zukunftsstrategie ökologischer Landbau, ZöL), which was presented to the public in 2017, will be overhauled in 2023 to become the Federal Government’s Organic Strategy 2030. The new strategy will contain measures along the entire value chain that contribute significantly to strengthening the organic farming and food production sector. The measures developed in a participatory process will range from strengthening the organic value chain to increasing the organic share of institutional food services, advising and connecting stakeholders, providing vocational education and training, promoting organic farming research and rewarding environmental services provided by organic farming.

[Margin column: The Federal Government wants to further expand organic farming to achieve a 30% share of land by 2030 (Federal Government 2021b: 46).]

Organic farming



Alt-Text:

The diagram shows the percentage of agricultural land that is organically farmed. The target under the German Sustainable Development Strategy is 30% in 2030. The figure in 2020 was 9.6% with an upwards trend.

Thematic areas

B 2.4 Agriculture, C 6 Agriculture and silviculture

Definition

Organically farmed land as a percentage of the total land used for agriculture

Target

Organically farmed land to increase to 30% of the total land used for agriculture in 2030

Core assessment

The proportion of organically farmed land area has increased continuously since 1999. It stood at 9.6% in 2020. However, this is far from the 30%-target.

2.3.3 High nature value farmland

Farmland biodiversity has decreased significantly in the last 50 years as a result of more intensive farming. To counter this loss, the EU supports rural development measures with the aim, among other things, of enhancing the quality of the landscape and the environment. Support for rural development in EU Member States is governed by the EAFRD Regulation.

As part of EU rural development policy, the high nature value farmland (HNV farmland) indicator was introduced for the funding periods 2007 to 2013 and 2014 to 2022. The purpose of the indicator is to help assess both the status of and trends in biodiversity in the agricultural landscape and the efficiency of the funding programme. To provide the data needed, agricultural areas and structural features typical of agricultural landscapes have been mapped on sample plots since 2009 in a monitoring project coordinated by the BfN and carried out by the Länder using a standardised survey and assessment method. The resulting percentages are estimated for the total farmland at both national and Land (federal states) level. For this purpose, the proportion of areas with high nature value in the agricultural landscape (as a percentage) and the absolute sizes of areas in the agricultural landscape (in ha) are regularly determined and classified into quality levels.

[Margin column: The indicator provides information on the size of agricultural land with high nature value (HNV farmland) that contributes to the conservation of biodiversity.]

Indicator

The indicator represents the percentage of high nature value farmland (HNV farmland) of total farmland. HNV farmland comprises species-rich grassland, arable land, orchards, vineyards and fallow land with low-intensity agriculture It also includes structurally rich landscape features such as hedges, field margins, field copses and small water bodies that form part of the farmed cultivated landscape. Plots and landscape features are classified using a defined system of quality criteria. HNV farmland is subdivided into land with exceptionally high, very high or moderately high nature value.

In the National Strategy on Biological Diversity, the share of agricultural land accounted for by high nature value farmland is targeted to increase by at least ten percentage points from 2005 to 2015. As monitoring did not start until 2009, the 2009 figure is taken as the starting value. Assuming a linear trend up to 2015, the target value marked an increase of at least six percentage points to a share of at least 19% of agricultural land by 2015. Since 2019, the HNV farmland indicator has been estimated based on an improved methodology that uses more accurate and current data for the reference area and takes a larger number of sample areas into account. To ensure the values were

comparable over the entire time series, the indicator values for all reporting years were recalculated using the new methodology. As a result of this change, the starting value in 2009, which provided the basis for the target value calculation, increased by approximately one percentage point, to almost 14%. The target value calculated for 2015 is thus 20%.

[Margin column: Council Regulation (EC) No 1305/2013 of 17 September 2013 governs support for rural development by the European Agricultural Fund for Rural Development (EAFRD). The EAFRD Regulation is supplemented by rules for its application set out in Commission Regulation (EC) No 808/2014 of 17 July 2014.]

Composition

HNV farmland is monitored nationwide in a representative set of sample plots each with an area of one square kilometre. The same plots are used for the monitoring of breeding birds, providing data among other things for the "Species diversity and landscape quality" indicator (see Section 2.1.1). Following the first overall survey in 2009, partial surveys have been conducted annually since then, meaning that a full survey cycle is completed every four years. Four Germany-wide surveys have thus been completed so far. The indicator value is updated annually for reporting purposes using the data from the last four years (four-year rolling average).

The survey involves inspecting all farmland and all structural features typical of agricultural landscapes in each sample plot. Areas and structural features to be classified as HNV farmland according to the uniform national survey key are mapped, recorded in a geographic information system and assessed. From the sample plots, the area of HNV farmland and of each of the three value classes is estimated for the whole of Germany and for each of the Länder, expressed as a percentage of total farmland.

Assessment

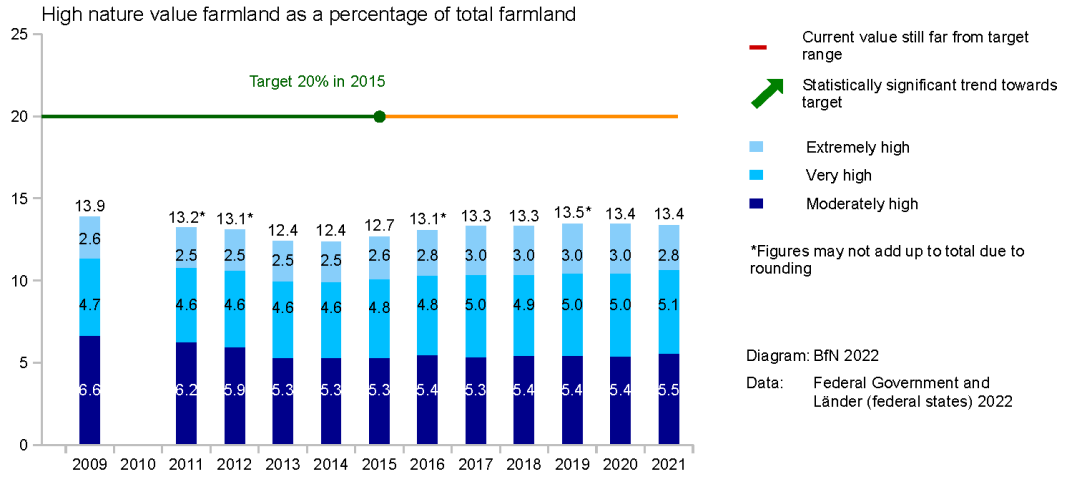
The 2021 survey returns an indicator value of 13.4% for the proportion of HNV farmland relative to total farmland. Some 2.8% of agricultural land was classified as land of exceptionally high nature value, 5.1% as land of very high nature value and 5.5% as land with moderately high nature value. In all years, the proportion of areas with moderately high nature value was greater than the proportion of areas with very high nature value, while those proportions were in turn greater than those of areas with exceptionally high nature value. Following a statistically significant decrease in the indicator values of approximately 11% from 2009 to 2014, a further significant increase occurred between 2015 and 2021, meaning that the value for 2021 was only 4% below the starting value. Overall, the indicator shows a statistically significant trend in the direction of the target. More in-depth analysis shows that the initial declines in the overall indicator were solely the result of the dramatic loss of

agricultural land (HNV grassland, arable land and fallow land), while the proportion of area accounted for by structural features increased over the entire period. However, the indicator value of 13.4% in 2021 is still very far from the target.

To increase the total share of HNV farmland to meet the 20% target, greater and targeted efforts are still needed, including under the new CAP, which entered into force on 1 January 2023.

[Margin column: "By 2015, the proportion of land used for valuable conservationist agro-biotopes (high-grade grassland, orchard meadows) has increased by at least 10% compared with 2005. In 2010, semi-natural landscape elements (such as hedges, borders, field shrubbery and small bodies of water) account for at least 5% of agricultural areas." (BMU 2007: 47)]

High nature value farmland



Alt-Text:

The diagram shows high nature value farmland as a percentage of total land used for agriculture. The indicator value fell continuously from the starting level of 13.9% in 2009 to 12.4% in 2013. From 2015, it rose again to 13.4% today. The target of 20% was expected to be reached in 2015.

Thematic areas

B 2.4 Agriculture, C 6 Agriculture and silviculture

Definition

High nature value (HNV) farmland as a percentage of total land used for agriculture

Target

The objective is to increase the percentage of HNV farmland to at least 20% of total farmland by 2015.

Core assessment

In 2021, the percentage of agricultural land of exceptionally high nature value was 2.8%, of very high 5.1% and of moderately high 5.5% (HNV farmland with a total percentage of 13.4%). To achieve the 20% target, targeted measures must still be taken to promote biodiversity in agricultural landscapes, paying particular attention to areas of arable and fallow land.

2.3.4 Genetic diversity in agriculture

The genetic diversity of crops and livestock is an essential basis and a valuable resource for future uses and innovations. It plays a role in securing our supplies of food and raw materials. Crop and livestock diversity along with knowledge about cultivation, breeding and use are also an important part of our cultural heritage. In the course of market globalisation and the consolidation of the agriculture and food industry, a wide range of crop species and varieties have disappeared from large-scale farming in Germany. This depletes the cultivated landscapes that have evolved historically and can lead to the loss of genetic potential indispensable for breeding purposes. In the case of livestock, breeds typical for a region have been displaced by a small number of globally farmed breeds. The National Strategy on Biological Diversity and the sectoral Strategy on Agrobiodiversity thus include the goal of conservation and sustainable use of the regionally characteristic genetic diversity of animal breeds and crop varieties.

For this purpose, the Federal Government, the Länder and other stakeholders have launched national programmes for plant, animal, aquatic and forest genetic resources. The National Programme for the Conservation and Sustainable Use of Animal Genetic Resources in Germany (TGR Programme) was readopted by the Conference of Agriculture Ministers in 2021. The programme provides guidance for a coordinated approach by everyone involved. It includes measures relating to cattle, pigs, sheep, goats, horses, rabbits, honeybees and poultry used in farming.

[Margin column: The indicator represents threats to genetic resources in agriculture using the example of selected indigenous farm animal breeds.

Indicator

The “Genetic diversity in agriculture” indicator assesses the extent of threats to animal genetic resources in agriculture. It is compiled by aggregating endangerment data for breeds of livestock species regulated under zootechnical legislation (horse, cattle, pig, sheep and goat) according to the red list of native livestock breeds in Germany. For this purpose, the TGR Programme specifies endangerment categories that form a graded scale of threat levels.

With the National Strategy on Biological Diversity, the Federal Government seeks to safeguard endangered livestock breeds. The aim is to prevent the total number of indigenous livestock breeds from declining. This gives rise to the goal to reduce the overall endangerment level to livestock breeds.

[Margin column: “The regional-typical genetic diversity of farm animal breeds and cultivated plant varieties is conserved, utilised sustainably, preserved as

a basis for life and breeding, and enriches the landscape and the range of agricultural and horticultural products." (BMU 2007: 30)]

Composition

The population statistics for the individual livestock breeds provided by the breeders' associations or breeding organisations and other bodies responsible for keeping herd books serve as the basis for the data. These statistics are compiled annually by the Information and Coordination Centre for Biological Diversity (IBV, Informations- und Koordinationszentrum Biologische Vielfalt) at the Federal Office for Agriculture and Food (BLE, Bundesanstalt für Landwirtschaft und Ernährung) and in the Central Documentation on Animal Genetic Resources in Germany (TGRDEU, Zentrale Dokumentation Tiergenetischer Ressourcen in Deutschland). The indicator is calculated every two years from the classifications of breeds using the endangerment categories drawn up under the TGR Programme and published in the red list of native livestock breeds in Germany (Einheimische Nutztierrassen in Deutschland und Rote Liste gefährdeter Nutztierrassen 2008, 2010, 2013, 2015, 2017, 2019, 2021, BLE). The categories are as follows:

(1) Phenotypic Conservation Population (PCP): breeds that merely survive as remnants in zootechnical terms but whose cultural value is undisputed

(2) Conservation Population (CP): highly endangered populations

(3) Monitoring Population (MP): endangered populations

(4) Non-Endangered Population (NE).

A breed's endangerment is measured by the effective population size. This is determined according to the specifications of the TGR Programme. In accordance with the German Animal Breeding Act (Tierzuchtgesetz), classification of breeds into endangerment categories is performed by the Federal Office for Agriculture and Food (BLE) together with the Scientific Advisory Board on Biodiversity and Genetic Resources.

The indicator shows the percentage of endangered indigenous horse, cattle, pig, sheep and goat breeds. The total number of assessed breeds can vary over time if new breeds emerge, other breeds die out or the distinctions between breeds are changed. New breeds – mostly horses – were thus included in the assessment from 2011. Certain cases justify a departure from the classification into red list endangerment categories according to effective population size. This can apply, for example, if a breed has only had a very small population size over multiple generations. Such decisions are reviewed in the subsequent monitoring cycle.

[Margin column: The term "indigenous" is defined under Article 2 (11) of the German Animal Breeding Act (Tierzuchtgesetz): "A breed is defined as indigenous if in respect of breeds in Germany

a) the original herd book was established in Germany and has been maintained there ever since, or for herd books established earlier, the herd book has been maintained in Germany since 1949

b) if the original herd book was not established in Germany but the only herd book for the breed is now maintained in Germany and a breeding programme is conducted there, or

c) if the original herd book was not established in Germany, but a herd book has been kept at least since 1949 on the basis of existing livestock in Germany and for which an independent breeding programme has been carried out."]

Assessment

The indicator shows the percentage of endangered indigenous horse, cattle, pig, sheep and goat breeds to be very high, at over 70% in 2019. However, the proportion of highly endangered livestock breeds in the Conservation Population endangerment category steadily decreased up to 2017 (there was a slight increase of 0.6% in 2019). The total number of breeds evaluated has increased considerably compared to 2006. While 64 breeds were initially evaluated in 2006, a total of 80 breeds were included in the evaluation in 2019.

Although the endangerment categories used in the data series remained basically the same, the criteria for assigning breeds to the categories were changed as of the 2011 survey year, so that some breeds were moved to a different category for methodological reasons. In addition, sub-populations previously considered separately were combined into breed groups or specific breed groups were divided into independent breeds. This means that the indicator values for the years 2006 and 2008 are only comparable with the data points for the following years to a limited extent.

The in some cases substantial redistribution of breed numbers among the categories between 2008 and 2011 is only partly due to the effectiveness of the conservation programmes. From 2011 to 2017, the classification of six breeds improved from Conservation Population to Monitoring Population. The expansion of the payment scheme for endangered livestock breeds granted in line with the agri-environment-climate measures and certain targeted projects have certainly provided support. In addition, regional livestock breeds benefit from the growing consumer interest in authentic, regional products. However, in the same period, one breed was downgraded from Monitoring Population to Conservation Population. Also, subdividing a breed group into separate independent breeds led to an increase in the number of livestock breeds in the Monitoring Population category. Despite these positive developments, the number of endangered livestock breeds is still too high (see table).

Table: Percentage of endangered indigenous farm animals (horse, cattle, pig, sheep and goat breeds)

	2006*	2008*	2011	2013	2015	2017	2019
Category	**Number of livestock breeds**						
NE: Non-Endangered Population	10	11	22	23	22	23	24
MP (Monitoring Population): Endangered populations	17	20	29	32	36	36	36
CP (Conservation Population): Highly endangered populations	24	23	18	15	14	13	14
PCP (Phenotypic Conservation Populations): Breeds only surviving as remnants	13	11	5	5	5	5	6
Total	**64**	**65**	**74**	**75**	**77**	**77**	**80**

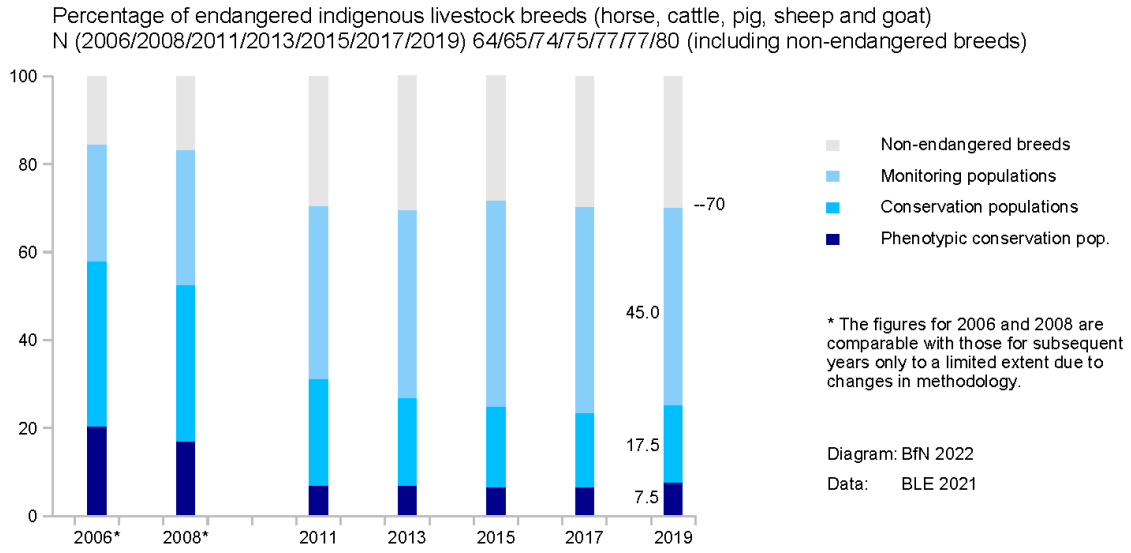
* Due to changes in methodology, the figures for 2006 and 2008 are only comparable with those of subsequent years to a limited extent.

The need for action varies considerably between the different farm animal species. The market potential of products from indigenous breeds already plays an important role. Where horses and cattle are concerned, the potential for using indigenous robust breeds in landscape management and nature conservation remains largely untapped. The challenge therefore continues to be ensuring sustainable use and long-term conservation of indigenous breeds on a species-specific basis.

To consistently reduce the endangerment of indigenous livestock breeds, targeted measures such as the animal welfare payments from agri-environment-climate measures must be continued and efforts made to promote broader use of indigenous livestock breed diversity, for example in organic farming, in regional value chains, landscape management and nature conservation.

The situation regarding livestock can only be transferred to other areas like crops to a very limited extent. For this reason, further indicators are currently being developed that will track plant genetic resources in addition to animal genetic resources and take developments at international level into account – for example, regarding the indicators for the United Nations Agenda 2030 for Sustainable Development.

Genetic diversity in agriculture



Alt-Text:

The diagram shows genetic diversity in farming as a percentage. In 2019, endangered native livestock breeds accounted for 70% of all livestock breeds.

Thematic areas

B 1.1.4 Genetic diversity of wild and domesticated species; B 2.4 Agriculture; C 2 Species conservation and genetic diversity; C 6 Agriculture and silviculture

Definition

The indicator provides information on the level of endangerment to genetic resources in agriculture using the example of the most important farm animals (horse, cattle, pig, sheep and goat breeds).

Qualitative target

Endangered farm animal breeds must be protected. The overall level of endangerment to farm animal breeds must be reduced.

Core assessment

In 2019, the proportion of endangered indigenous breeds is very high at 70%. Targeted measures must be taken to reduce the level of endangerment.

2.3.5 Agricultural nitrogen surplus

Nitrogen is one of the most important plant nutrients. Through precision fertilisation and crop rotation, the nutrients removed from the soil during crop production are replaced to secure both yields and the quality of harvested products and to maintain soil fertility in the long term. For economic reasons as well as for reasons related to nature conservation and environmental protection, it is particularly important to ensure that the nutrients in fertilisers are used efficiently. Under legislation governing their use, fertilisers must be applied in accordance with the principles of good farming practice. This means that the type, quantity and timing of fertiliser application must be attuned to the needs of crops. In 2020, 48% of the nitrogen applied to farmland came from mineral fertilisers and 52% from farm manure from livestock farming, plant and animal digestate from biogas production and other organic fertilisers. The average for the past five years was 50% mineral fertilisers and 50% organic fertilisers. Farming, and especially intensive livestock farming, contributes significantly to the input of nitrogen into ecosystems such as ground and surface waters, forests, heaths and peatlands. This mainly occurs through leaching and run-off and atmospheric deposition. Spreading animal excrement and plant digestate as farm manure, storing farm manure and keeping livestock in stables all produce ammonia emissions. Other sources contribute to nitrogen inputs, notably transport, industry and private households.

Excessive quantities of nitrogen entering the environment (from farming, transport, industry, private households, etc.) lead to far-reaching problems: groundwater contamination, excess nitrogen in inland waters, seas and terrestrial ecosystems (eutrophication), greenhouse gas emissions and acidifying air pollution with its negative implications for the climate, biodiversity and landscape quality. Air pollutants also impact human health.

As increasing concentrations of nutrients in inland and coastal waters show, diffuse inputs of nitrogen and other compounds are still too high, especially in regions with intensive agricultural land use and livestock farming. Agricultural nitrogen surpluses, especially in regions with high livestock densities, can contribute significantly to nitrate pollution of groundwater.

The net total of nitrogen agricultural inputs and nitrogen outputs (crop and livestock farming) serves as an indicator for the documentation, analysis and assessment of agricultural sustainability in the broadest sense. It is part of the set of indicators under the German Sustainable Development Strategy and has also been reported recently in the 2021 Indicator Report published for this strategy (Statistisches Bundesamt 2021a). The indicator is closely linked to the “Ecological status of surface waters” and “Eutrophication of ecosystems” indicators outlined in the National Strategy on Biological Diversity.

[Margin column: The indicator provides information on the development of agricultural nitrogen surpluses.]

Indicator

The indicator provides information on the development of agricultural nitrogen surpluses. This allows conclusions to be drawn about potential pressures on environmental media and habitats. The indicator is calculated as an aggregate nitrogen balance for Germany as a whole. The degree of aggregation does not allow conclusions to be drawn on regional surpluses.

[Margin column: "The calculated nitrogen surpluses are averages for Germany, and represent a yardstick of the potential discharges into groundwater, surface waters and the air." (BMU 2007: 131)]

The substances used in agricultural production, including nitrogen, cannot be fully utilised by crops. Agricultural production mostly takes place in open systems and over long periods of time. Moreover, not all nitrogen compounds are available to crops as nutrients in the same way. In addition, quantities of nitrogen remain on the field with crop residues, which are important for the humus content of the soil and thus for soil fertility, and are also included in the nitrogen surplus. For some crops (e.g. rapeseed and vegetables), these residues can be significant. In the National Strategy on Biological Diversity, the Federal Government set a quantitative target of reducing annual net nitrogen surpluses in agricultural production to 80 kg/ha of farmland by 2010. Further reductions are aimed for by 2015. In 2016, the revised version of the National Sustainability Strategy set the goal of reducing nitrogen surpluses to an average of 70 kg/ha per year for the period 2028 to 2032.

[Margin column: In the 2016 version of the German Sustainable Development Strategy, the goal of reducing nitrogen surpluses to an average of 70 kg/ha per year was set for the period 2028-2032 (Bundesregierung 2017).]

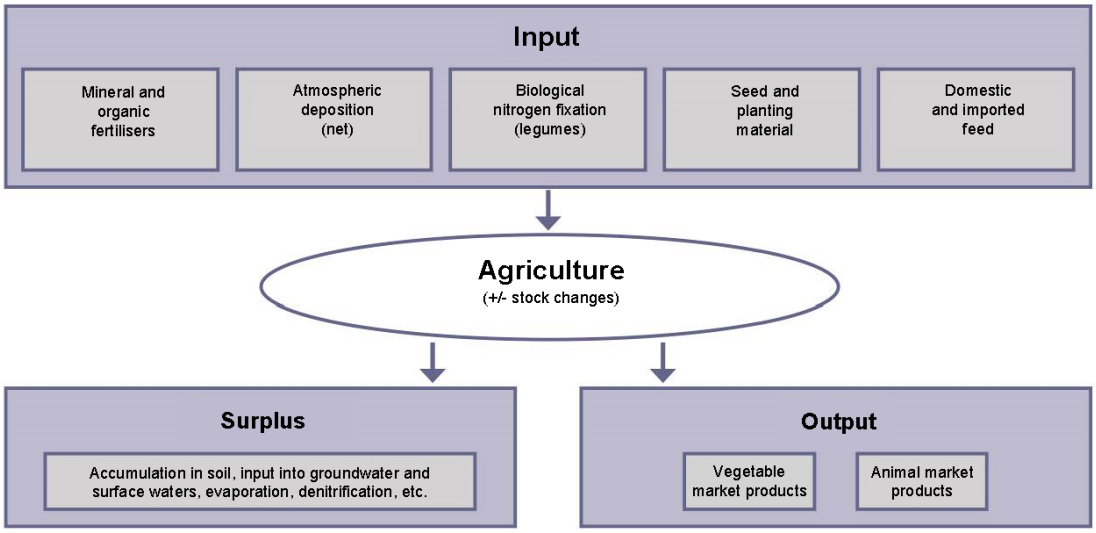
Composition

The indicator represents the overall net nitrogen surpluses for Germany in kg/ha of farmland per year. It is calculated as the net total of nitrogen inputs and nitrogen outputs (see figure below). The nitrogen inputs taken into account comprise nitrogen from fertiliser, atmospheric deposition, biological nitrogen fixation, seed and propagating material and from domestic and imported animal feed. Nitrogen outputs consist of nitrogen in plant and animal products. The net surplus is calculated on the basis of a farm gate balance, meaning that nitrogen flows within a farm are not counted. The resulting annual nitrogen surpluses in kg/ha of farmland are averages for Germany as a whole and do not allow any conclusions to be drawn about regional and farm-specific surpluses.

Important individual data sources include agricultural structure surveys of the Federal Statistical Office and statistical yearbooks on food, agriculture and forestry of the Federal Ministry of Food and Agriculture (BMEL). Variations in stocks and inventories at farm level (livestock, fertiliser, animal feed, etc.) and in the soil are not included. Where exact survey data is not available (e.g. for gaseous losses), official calculations are used.

The primary time series for the indicator is a five-year rolling average, which is calculated from the total balance for the year in question and the two preceding and following years. This compensates for annual fluctuations that farmers cannot influence due to weather and market-related conditions.

Agricultural nitrogen balance (schematic representation)



Assessment

From 1992 to 2018, the annual nitrogen surplus fell by 25%, from 116 kg/ha to 87 kg/ha (five-year rolling average). There is a statistically significant trend towards the target value of 70 kg N/ha per year. That trend weakened in the period 2005 to 2015 and a sharper decline is evident from 2016 to 2018. However, the current value is still well above the target value. The sharp decline in nitrogen surplus early in the time series relates to reductions in the use of fertiliser and in livestock in the Länder of former East Germany. The comparatively weak decline over the further course of the time series is based on a slight decrease in the use of mineral fertilisers and an increase in harvest yields due to technical advancement in crop production and breeding (more efficient nitrogen fertilisation and the range of varieties) with a parallel expansion in the cultivation of high-yield crops (maize and wheat) and improved feed conversion ratio in livestock. In 2020, at 49% (83 kg nitrogen per hectare per year), mineral fertilisers were the most important component of nutrient inputs in the overall balance. Other significant contributors to nitrogen inputs comprised feed with 36.9% (62 kg/ha), biological nitrogen fixation with 8.2% (14 kg/ha) and atmospheric deposition with 1.9% (3 kg/ha). While nitrogen inputs per ha decreased by about 6% between 1992 and 2018, nitrogen removals per ha increased to a far greater extent, by 24% between 1992 and 2018. In 2018, almost two-thirds of nitrogen discharge from agriculture was from plant products and one-third from animal products.

To achieve the target of 70 kg/ha in the five-year average over the period 2028 to 2032, it is necessary to increase the efficiency of nitrogen fertiliser application, take further measures to reduce nitrogen inputs and develop measures for feeding animals that use nitrogen more efficiently.

The 2017 revision of the Fertilisation Act and the Fertiliser Application Ordinance (last amended in 2020) will make an important contribution to the reduction of nitrogen inputs from farming. With the new regulations, stricter requirements now apply, among other things, to the maximum application limits for organic fertilisers. In addition, farms are required to develop fertiliser application plans in accordance with uniform nationwide specifications. Also, the Ordinance on Nutrient-Flow Balances (Stoffstrombilanzverordnung) adopted in 2017 is intended to transparently calculate all nutrient flows into and out of a farm so as to better control permissible nutrient surpluses. The amendments to the Fertiliser Application Ordinance in 2020 following a ruling

of the European Court of Justice (ECJ, Case C-543/16)[5] are expected to result in further reductions in the “Agricultural nitrogen surplus” indicator.

In the period up to May 2019, a National Clean Air Programme was adopted by the Federal Cabinet to implement the Directive on the reduction of national emissions of certain atmospheric pollutants (new NEC Directive, Directive (EU) 2016/2284). Among other things, it sets out the measures suitable for reducing ammonia emissions, mainly from agriculture, by 29% by 2030 compared with the reference year, 2005. The same applies to reducing nitrogen oxide emissions by 65% in the same period. The National Clean Air Programme will be updated at least every four years; work on the second version is currently in progress.

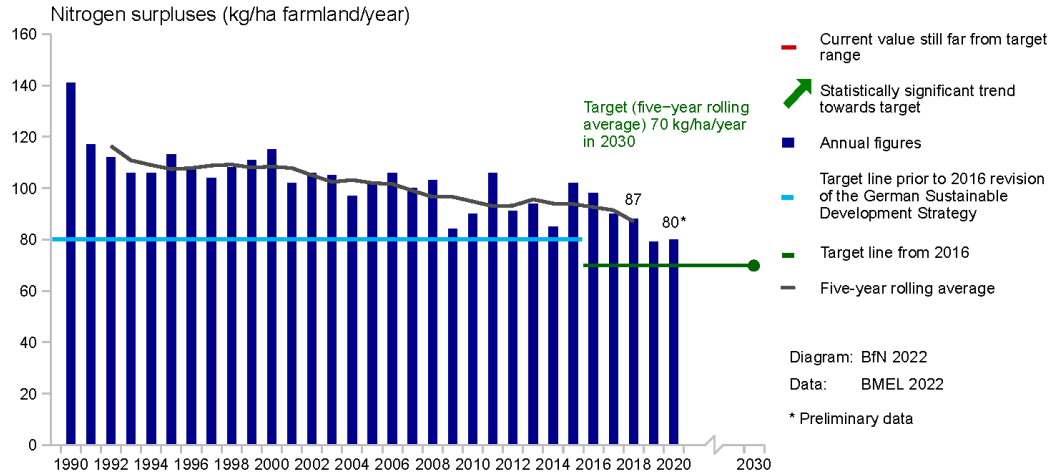
In addition, as part of an integrated nitrogen strategy, the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection is currently calculating a regionally differentiated ecological nitrogen limit for Germany. In a next step, the regional limits will be used to determine a national emissions target for reactive nitrogen, and cross-sectoral measures will be taken to ensure the target is achieved. Agriculture harbours vast potential for reducing reactive nitrogen.

The Federal Government assumes that the measures already implemented and the programmes currently being developed will lead to reduced nitrogen surpluses and reduced nitrate inputs into water bodies in the medium term.

Due to methodological changes from 2017 onwards, the data series used for the indicator was also recalculated retrospectively and thus differs from previous publications.

[5] The new Fertiliser Application Ordinance was published in the Federal Law Gazette on 30 April 2020 (BGBl. Part 1, No. 20) and entered into force on 1 May 2020.

Agricultural nitrogen surplus



Alt-Text:

The diagram shows the nitrogen surplus in agriculture. The target of 70 kg N/ha is set for 2030. The five-year rolling average fell to 87 kg N/ha in 2018, but this is still far from the target range.

Thematic areas

B 2.4 Agriculture, C 6 Agriculture and silviculture, C 10 Acidification and eutrophication

Definition

Difference between nitrogen inputs and outputs in agriculture (overall surplus based on a farm gate balance)

Target

For the period 2028 to 2032, a reduction of nitrogen surpluses in the overall balance to 70 kg/ha of agricultural land per year is to be achieved as a five-year average.

Core assessment

From 1992 to 2018, the annual nitrogen surplus fell from 116 kg/ha to 87 kg/ha (five-year rolling average). To achieve the target of 70 kg/ha in the five-year average over the period 2028 to 2032, it is necessary to increase the efficiency of nitrogen fertiliser application, take further measures to reduce nitrogen inputs and develop more nitrogen-efficient measures for feeding animals.

2.3.6 Eutrophication of ecosystems

Reactive nitrogen compounds enter the atmosphere from various sources, including industry, transport, private households and farming. They enter ecosystems via wet deposition (rain and snow), moist deposition (mist and hoarfrost) and dry deposition (gases and particulates). There, they act as nutrients whose accumulation (eutrophication) particularly affects plants and animals found in naturally nutrient-poor habitats. Eutrophication can result, for example, in plants adapted to low-nutrient habitats being displaced by species that thrive on more nutrients. Numerous animal species that depend on specific plant species can be indirectly affected. Biodiversity in aquatic ecosystems is further damaged by excess atmospheric nitrogen compounds from terrestrial ecosystems leaching into water bodies in addition to direct atmospheric inputs.

Ecosystem-specific load limits for atmospheric inputs of harmful substances and nutrients are known internationally as critical loads (CLs). According to current knowledge, no acute or long-term harm to affected ecosystems can be expected as long as these limits are not exceeded. However, it can take decades for ecosystems to show visible signs of harm and, conversely, equally long for them to recover from long-term exceedance of CLs. As substances are transported in the atmosphere across long distances and national borders, various international agreements are in place with the aim of reducing air pollution. The Gothenburg Protocol to the Geneva Convention on Long-Range Transboundary Air Pollution, which was amended in 2012, sets national emission reduction commitments for ammonia and nitrogen oxides that must be met from 2020. At EU level, the National Emission Ceilings Directive (NEC Directive – (EU) 2016/2284) sets national emission reduction commitments to be complied with up to 2030.

The indicator on eutrophication – “Eutrophication of ecosystems” – was introduced with the 2016 version of the German Sustainable Development Strategy and incorporated into its indicator set and in the NBS. It is thus regularly included in the Indicator Reports for Germany’s National Sustainable Development Strategy, most recently in the 2021 Indicator Report (Statistisches Bundesamt 2021a).

[Margin column: The indicator provides information on impairments to biodiversity due to exceedance of critical loads for eutrophying nitrogen inputs.

[Margin column: “More than half of vascular plants are only viable under low-nutrient conditions, and their stocks are therefore at risk from excessively high nitrogen discharge rates.” (BMU 2007: 80)]

Indicator

The indicator represents the percentage of assessed land of sensitive ecosystems (including nutrient-poor forest ecosystems, heaths and peatlands) where ecosystem-specific critical loads of airborne eutrophying nitrogen inputs are exceeded. Ecosystem-specific critical loads indicate the amount of a nutrient per area and time period that, according to current knowledge, can be deposited in a given ecosystem without causing damage in the longer term. In the long term, nutrient inputs may only be high enough for the nutrients to be stored or absorbed by internal processes or to be released from the system at a safe rate.

In accordance with the goals of the German Sustainable Development Strategy, the percentage of land exceeding critical loads of eutrophying nitrogen is to be reduced by 35% by 2030 compared with levels in 2005. Based on current data from 2022, this corresponds to a 52% reduction within the area of the assessed ecosystems. Previously, in the National Strategy on Biological Diversity, the Federal Government had formulated the ambitious goal of achieving nationwide compliance with the critical loads of eutrophying nitrogen in sensitive ecosystems by 2020.

[Margin column: The new version of the German Sustainable Development Strategy includes the goal of reducing the percentage of land with increased nitrogen input by 35% compared with 2005 (Bundesregierung 2021a).]

Composition

Ecosystems considered to be sensitive to eutrophying nitrogen inputs include the following types of land use (Corine Land Cover nomenclature guidelines): low-nutrient meadows and pastures, deciduous, coniferous and mixed forests, natural grassland, moors and heathlands, swamps and peat bogs. Critical loads specific to these ecosystem types are determined by taking into account factors such as vegetation, geological substrate and soil chemistry. A total of almost one-third of Germany’s land is assessed this way. The following data is used to determine the national critical loads of eutrophying nitrogen inputs:

- Overview soil map of Germany (Bodenübersichtskarte Deutschlands 1000, BÜK)
- Map of the mean annual water percolation rate from the soil
- Land cover map (Corine Land Cover 2012)
- Climate data for Germany, long-term average (1981-2010)

Critical loads of eutrophying nitrogen inputs have most recently been calculated at a specific spatial resolution on behalf of the Federal Environment Agency (UBA) by the National Focal Centre of the International Cooperative Programme on Modelling and Mapping (ICP M & M) under the Geneva Convention on Long-Range Transboundary Air Pollution. Also on behalf of

UBA, the temporal and spatial distribution of pollutant and nutrient inputs was calculated as part of the PINETI-4 project[6] by the Netherlands Organisation for Applied Scientific Research (TNO) for the years 2000, 2005, 2010 and 2015 to 2019 at a resolution of 1 x 1 km^2. In addition to updating the time series, the project includes methodological improvements compared with the previous PINETI-3 dataset. For example, a higher model resolution and a more accurate spatial distribution of emissions from livestock farming were introduced. In addition, the newly calculated values are based on more recent emission calculations. The exceedance of critical loads indicator shown here was determined by comparing the pollutant inputs with the critical loads.

Assessment

Exceedance of critical loads as a result of long-term and current inputs of nitrogen compounds is an indicator of potential harm to the sensitive ecosystems affected. If critical loads are found to have been exceeded in certain areas, it does not mean that biological effects were visible or that damage was actually detected in the year under consideration. This is partly because negative effects can take a long time to appear.

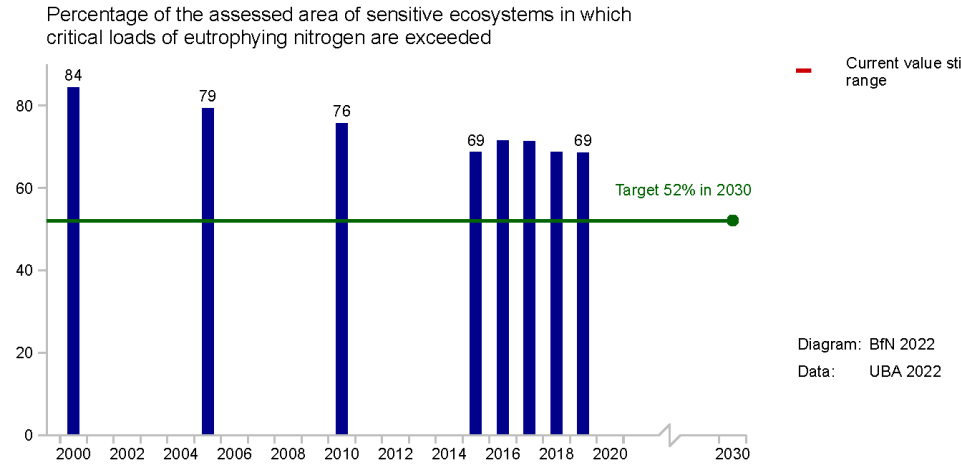
The percentage of land with modelled exceedances of critical loads of eutrophying nitrogen compounds has steadily declined since 2000 and stood at 69% in 2019. There is thus still a risk of eutrophication in more than two-thirds of the land assessed. While emissions of eutrophying nitrogen compounds from transport and industry have significantly decreased, there is no evidence of a downward trend in ammonia emissions from farming. Ammonia emissions in Germany have been on the decline since 2016, but still account for more than 60% of nitrogen emissions. National and international clean air measures have delivered only minor improvements in eutrophication compared with the successes achieved in combating acidification, because sulphur inputs, which also cause acidification, have declined to a greater extent. Thus, despite the emission reductions achieved, the background load of atmospheric eutrophying nitrogen compounds is still too high.

To reduce the percentage of land with sensitive ecosystems with elevated nitrogen loads to 52% by 2030, the reduction in nitrogen inputs seen in recent years must be continued. In particular, it is necessary to further reduce ammonia emissions, 95% of which come from agriculture, mainly from livestock farming. This can be achieved, for example, by applying low-emission methods in the storage and application of farm manure, including digestate, as

[6] PINETI-4 (Pollutant INput and EcosysTem Impact) is a research project of the Federal Environment Agency (2019-2023). Results and methodologies used to determine inputs of pollutants are published in a final report (Schaap et al., 2023, in preparation).

well as in mineral fertilisation and, where necessary, through adapted, lower nitrogen feeding methods.

Eutrophication of ecosystems



Alt-Text:

The diagram shows the exceedance of critical loads for nitrogen as a percentage. The target of 52% is set for 2030. In 2019, the indicator stood at 69%. This is still far from the target range.

Thematic areas

B 3.1 Area-wide diffuse substance discharges, C 10 Acidification and eutrophication

Definition

Percentage of the assessed areas of sensitive ecosystems where ecosystem-specific critical loads of eutrophying nitrogen are exceeded in the models

Target

Reduction in the percentage of sensitive ecosystems with exceedances of the critical loads for nitrogen inputs by 35% by 2030 compared with 2005. This corresponds to a reduction to 52% within the area of all assessed sensitive ecosystems.

Core assessment

In 2019, the critical loads were exceeded in 69% of the assessed areas of sensitive ecosystems. To reduce the share of land with increased nitrogen inputs to 52% by 2030 and to continue the reduction of nitrogen inputs of recent years, further efforts are needed, especially to achieve a significant and lasting reduction of ammonia emissions from agriculture.

2.3.7 Sustainable forestry

Nearly a third of Germany's land area is covered with forest. Forests are home to a great diversity of sometimes rare and endangered plant and animal species and habitats. The structure and function of the forests in the landscape regime are shaped by forestry uses and the needs of society on most of the land. These also largely determine the presence and frequency of many animal and plant species in forests. How forests are managed is thus of great importance for biodiversity conservation.

Left to nature, Germany's forests would be dominated by deciduous tree species. The composition and age of today's forests, which were severely damaged in the Second World War and subsequently reafforested in accordance with the practices at the time, are dominated by conifers, particularly spruce and pine.[7] Between 2002 and 2012, percentage of land covered by spruce decreased by 8% and by 3% for pine, and in 2012 they stood at 25% and 22%, respectively. In addition, spruce forests with scarce water availability have been particularly affected by large-scale disturbances due to the drought events between 2018 and 2020 and in 2022 and the subsequent mass proliferation of the bark beetle. It is estimated that some 500,000 ha of forest land requires reforestation. However, all stand-forming deciduous tree species, such as oaks and beeches, are also negatively affected by the ongoing drought.

Mixed deciduous forests contribute significantly to groundwater replenishment and availability and promotes both the stability and adaptability of forest stands – for example to pests, storms and climate change.

A goal of federal- and federal state-level forestry policy is thus to turn monoculture coniferous forest into mixed forest stands comprising indigenous tree species suited to local site-specific conditions. This is a component of forestry guidelines for many forests managed by the Länder and has been used for decades in non-state forests with considerable resources, for example through the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK). In addition, for the period 2022 to 2026, the Federal Government has allocated funding in the amount of 900 million euros to promote climate-adapted forest management that takes account of various criteria for sustainable and climate-adapted forestry. The 2012 National Forest Inventory[8] provides data to document the successes achieved with these

[7] Data based on BWI 2012. See Footnote 8.

[8] The Fourth National Forest Inventory commenced in April 2021. The data surveys were largely completed by the end of 2022. Publication is expected at the end of 2024. It will then be possible to provide updated information.

efforts: In 2012 there were already more deciduous trees in German forests, covering some 43% of forest land. This represents an increase of around 7% compared with 2002. The 2017 Carbon Inventory estimates the share of deciduous trees to be 45%.

The age and structural diversity of forests have also increased: almost a quarter of forest (24% of forest land) is more than 100 years old (an increase of 18% compared with 2002), and 14% is more than 120 years old. Germany's forests have also seen an increase in the number of old habitat trees and the volume of dead wood. These special microhabitats make an especially significant contribution to biodiversity.

Deciduous and mixed forests account for 76% of German forest land. Natural regeneration predominates, accounting for 85% of area with young forest cover. The percentage of forest area with a near-natural tree species composition has changed only slightly compared with the National Forest Inventory 2002. According to the 2012 National Forest Inventory, 15% of forests are in a very near-natural state and a further 21% are classified as near-natural. Features of near-natural forests include – depending on the type of forest, development phase and site-specific conditions – indigenous tree species that are adapted to site-specific conditions, a pronounced vertical structure consisting of different vegetation layers, an adequate proportion of mature trees and dead wood and many small-scale structures offering habitats for specialised species.

Conserving and promoting forest biodiversity requires greater emphasis on near-natural forms of forestry management. Forest management certification can be an effective instrument for use in improving biodiversity conservation in forests beyond the legally required standards and ensuring environmentally, socially and economically sustainable forest management through the use of appropriate management methods. Germany currently has three established forest management certification systems:

The **Programme for the Endorsement of Forest Certification (PEFC)** goes back to an initiative of the Confederation of European Forest Owners. It was established in 1999 on the basis of the Second Ministerial Conference on the Protection of Forests in Europe held in Helsinki. The PEFC system is supported by many private, local government and state-owned companies in the forestry and timber industry. The **Forest Stewardship Council (FSC)** was established in 1993, a year after the United Nations Conference on Environment and Development in Rio de Janeiro. FSC is supported by environmental, nature conservation and social organisations and many private-sector enterprises. Naturland certificates are also marketed and awarded as part of FSC group certification.

[Margin column: The indicator provides information on the contribution of sustainable forestry to biodiversity conservation.]

[Margin column: The Federal Government formulates its vision for the future as follows: "The forests in Germany have a high level of natural diversity and momentum in terms of their structure and species composition, and people are fascinated by their beauty. The number of natural and near-natural forest communities has increased significantly. Forests are sustainably managed in line with their ecological and social functions." (BMU 2007: 31)]

Indicator

The indicator represents the forest area certified under the – in terms of area covered – most important certification schemes (PEFC and FSC) as a percentage of total German forest area, where the area is intended for permanent timber production (timber flooring according to the National Forest Inventory surveys in 2002 and 2012). In the National Strategy on Biological Diversity, the Federal Government set a target of 80% of forest area to be certified to high-quality ecological standards by 2010 (BMU 2007: 32). In the current coalition agreement, the Federal Government has set a medium-term target of managing federally owned forests to at least FSC or Naturland standards.

Composition

The indicator is calculated from data provided by the PEFC and FSC certification bodies. It should be noted that forest areas can be certified under both schemes at the same time. As it is not known what proportion of certified land is certified under both schemes, the areas are shown as adjacent bars in the diagram. The status is calculated on the basis of the minimum size of the certified forest area. As trends in PEFC- and FSC-certified area sizes are independent of each other, no overall trend can be specified for the indicator. The reference value for calculating the percentages is the total forest area in Germany intended for permanent timber production. According to the National Forest Inventory 2012, this came to approximately 11.1 million ha.

Assessment

In 2021, 78.7% of forest area was PEFC-certified and 12.2% of the total forest area in Germany was FSC-certified. The total for 2021 was thus between 78.7% and 91% and hence close to the target range, although it should be noted that the target value of 80% was set to be reached by 2010.

Over the last two years (2019 to 2021), the percentage of PEFC-certified forest increased by 10%. This corresponds to a total of more than one million ha of forest with first-time PEFC certification. This can be attributed to the fact that in summer 2020, as part of the economic stimulus package, the Federal Government made 500 million euros available for the conservation and

sustainable management of forests in the form of a one-off area-specific premium tied to forest certification.[9]

The share of FSC areas decreased between 2006 (5.5%) and 2010 (3.9%), but then rose again. It reached the highest level in the time series to date in 2018 (12.3%). This means that the percentage of FSC-certified areas is still far below the percentage of PEFC-certified areas. The significant increase in FSC areas in 2014 is due to the certification of 317,500 ha of forest owned by the state of Baden-Württemberg.

In the meantime, almost all federal and Länder-owned forest is PEFC- or FSC-certified and some are certified by both.

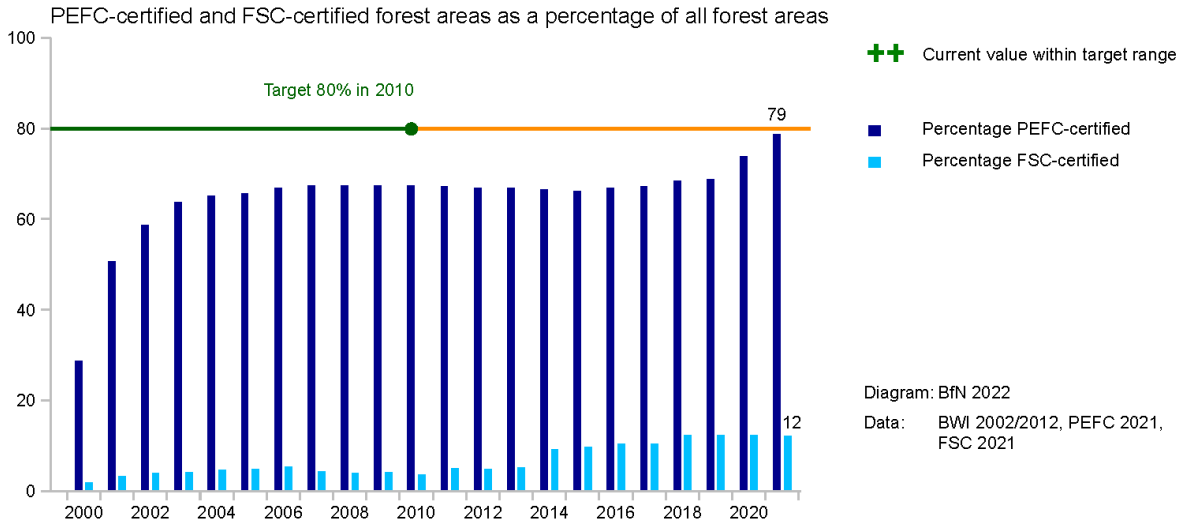
[Margin column: Reasons for species endangerment in Germany cited in the National Strategy on Biological Diversity include: "Local deficits in forest management (inadequate ageing and decay periods and insufficient proportions of tree hollows and dead wood, poorly structured stocks, non-native tree species, a lack of modification in forestry techniques and wood harvesting methods)." (BMU 2007: 17)]

[Margin column: The Federal Government has set as a target in the National Strategy on Biological Diversity: "To certify 80% of woodland to high ecological standards by 2010" (BMU 2007: 32).]

[Margin column: "In forestry, the German Government is calling for semi-natural forest management throughout all land used for silviculture purposes, as far as possible." (BMU 2007: 72)]

[9] https://www.bundeswaldpraemie.de/hintergrund (as of 27 June 2022)

Sustainable forestry



Alt-Text:

The sustainable forestry diagram shows the percentages of forest areas that are certified. The target was 80% in 2010. This target was missed, with the percentage of certified forest areas standing at 65% in 2010 and rising to 79% in 2020.

Thematic areas

B 1.2.1 Forests, C 6 Agriculture and silviculture

Definition

Proportion of PEFC- or FSC-certified forest area as a percentage of total forest area

Target

80% of forest area to be certified to high-quality ecological standards by 2010

Core assessment

In 2021, 78.7% of all forest area was PEFC-certified and 12.2% was FSC-certified. This is evidence that sustainable forest management in line with environmental, economic and socially responsible sustainability standards is taken very seriously by forest owners and managers and is verifiably implemented beyond the legal standard with the help of certification. The ongoing aim is to further increase the overall percentage of forest area certified to high-quality ecological standards.

2.4 Climate change

2.4.1. Length of the vegetation period

Climate change is expected to bring about changes in biodiversity throughout the world, including in Germany. This can affect the distribution and abundance of plants and animals, the composition of ecological communities and the structure and functions of habitats. In many cases, as seen with species distribution, the impacts of climate change are already known and scientifically proven. The development of many organisms is influenced less by short-run temperature changes and more by the temperature trend over long periods of time such as months or years. Monitoring the seasonal development of plants and animals – known as phenological monitoring – is thus a useful way of identifying the long-term impacts of climate change on biodiversity.

Changes in the length of the vegetation period[10] depend on the onset date of phenological spring (the beginning of the vegetation period) and the onset date of phenological winter (the end of the vegetation period, at the end of autumn). The onset of spring and winter is largely determined by temperatures in the preceding months. Higher temperatures at the end of phenological winter result in a measurable acceleration in plant development and hence an earlier onset of phenological spring. Conversely, the onset of winter is delayed if temperatures are higher at the end of phenological autumn. If the period during which, for example, plants build biomass and proliferate is longer, this has far-reaching consequences for biodiversity. Many animal species are also affected both positively and negatively by these phenological changes – for example, birds are affected due to changes in food availability during the breeding season. However, the full impacts of global warming on animals and plants and their ecological communities are highly complex and are only just beginning to be understood.

[Margin column: The indicator represents the length of the vegetation period as the sum of the days of phenological spring, summer and autumn.]

[Margin column: Climate change and associated global warming not only affect the seasonal patterns of animal and plant life, their distribution and growth rates and cause changes in animal behaviour. They are also a cause of biodiversity loss (BMU 2007: 81).]

[10] In areas with distinct seasons, the vegetation period comprises the period during the year when plants grow, flower and bear fruit. The phenologically defined vegetation period includes phenological spring, summer and autumn.

Indicator

The indicator represents changes in the length of the vegetation period along with shifts in the annual onset of phenological spring and winter relative to selected development stages of two indigenous wild plant species. This is supplemented with time series for the mean temperature in the three months preceding the onset of phenological spring and winter.

The Federal Government's climate change policy is in line with the goal agreed at the 2015 Climate Change Conference in Paris of limiting global warming to well below 2 °C and, if possible, to 1.5 °C below pre-industrial levels. This does not allow a quantitative target to be derived for this indicator. However, it is essential to seek to prevent the vegetation period from becoming even longer and to counteract further shifts in the phenological seasons by pursuing a resolute climate policy.

Composition

The phenological monitoring programme of the German Meteorological Service (DWD, Deutscher Wetterdienst) covers a large number of indicator plants, in some cases with time series dating as far back as 1951. Germany thus has a precise nationwide record of phenological shifts. Certain events in the development of selected plant species are suitable for making assertions about the impacts of climate change on biodiversity. The first flowering of coltsfoot (*Tussilago farfara*) was selected as a phenological phase indicating the onset of phenological spring. When the pedunculate oak (*Quercus robur*) begins to lose its leaves marks the transition from phenological autumn to winter. The onset of these two events is given as the number of days from the beginning of the year. The data reported to DWD is averaged to produce an annual mean figure for Germany as a whole.

The length of the vegetation period corresponds to the sum total of the number of days comprising phenological spring, summer and autumn and is determined from the length of time between the onset dates of phenological spring and winter. It is plotted continuously against the years in the time series and shown together with the mean temperatures during the three months preceding each phenological season. A linear trend line is additionally shown for all data series for the entire reporting period from 1951 to 2021.

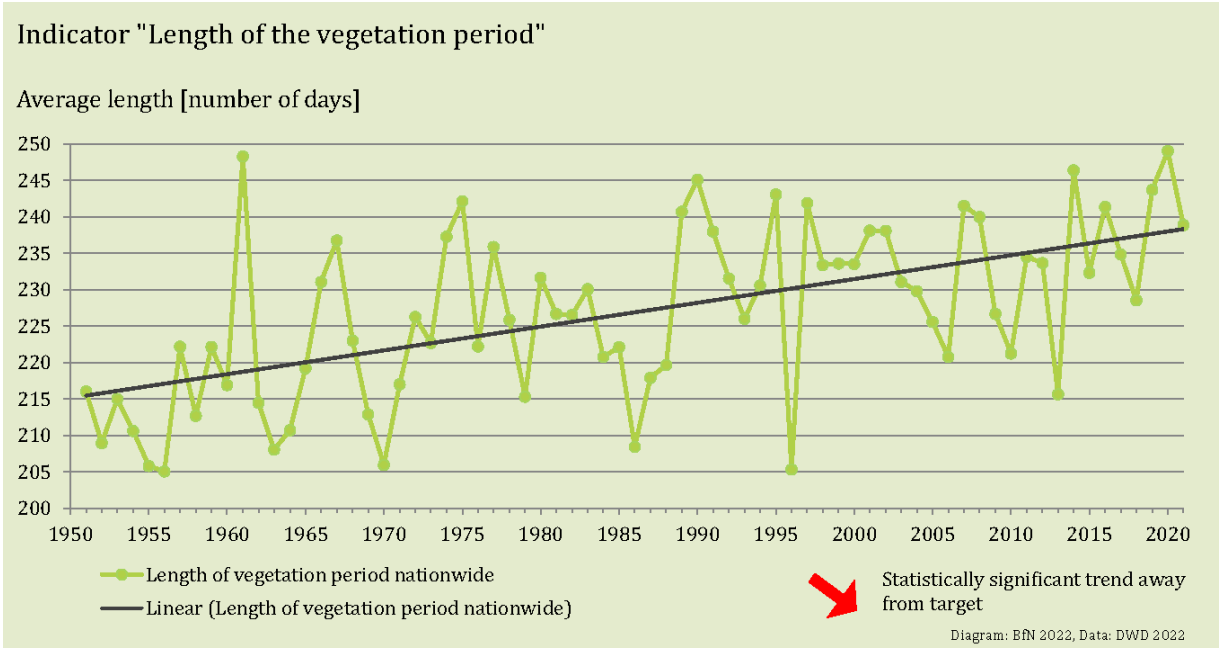
Assessment

The linear trend in the data points shows a marked increase in the length of the vegetation period by about 23 days to most recently about 238 days over the period 1951 to 2021. This corresponds to a mean increase of approximately one day every three years over the past 70 years. This trend also becomes clear when the two 30-year periods at the beginning and end of the data series are compared: while the vegetation period lasted just 221 days on average in the years between 1951 and 1980, it increased by 12 days to

an average of 233 days in the years between 1989 and 2021. It should be noted that the curve shows significant variability over the years: 2020 was the year with the longest vegetation period so far (249 days), followed by 1961 with 248 and 2014 with 246 days. Several other peak lengths have, however, occurred in the past 30 years (1975: 242 days, 1990: 245 days, 1995: 243 days, 1997: 242 days, 2007: 242 days and 2016: 241 days). The shortest vegetation periods, with a maximum duration of 215 days, occurred with a distinct concentration in the 1960s and 1970s, while none occurred in the past 20 years.

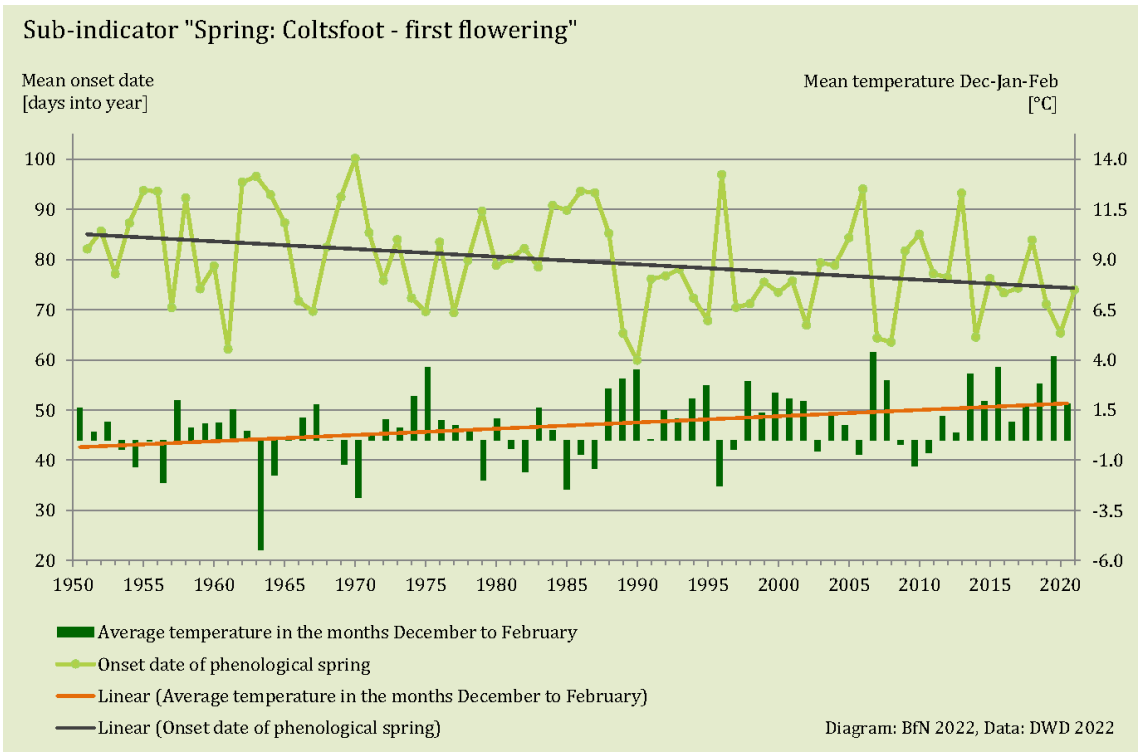
Phenological spring begins earlier and earlier in the year. The linear trend shows the onset of spring to be nearly 11 days earlier at the end of the time series in 2021 than when it started in 1951. Exceptionally early onset dates have occurred frequently since the late 1980s. While the average date for the onset of spring between 1951 and 1980 was 23 March, the average date in the years between 1992 and 2021 was six days earlier on 17 March. The onset of phenological winter, on the other hand, is happening later and later each year. The linear trend shows the onset of winter to be 12 days later at the end of the time series in 2021 than when it started in 1951. The onset of winter also shows pronounced variation from year to year. Looking at the years between 1992 and 2021, the beginning of winter came on average on 5 November, six days later than the average date in the period 1951 to 1980.

Phenological observations since 1951 show an early onset of spring, which, in combination with a late onset of winter, leads to a significantly longer vegetation period. This trend shows a statistically significant correlation with an increase in air temperatures in the respective preceding months and is due to anthropogenic warming of the Earth’s atmosphere. A longer vegetation period has various impacts on biodiversity in Germany. For example, it can result in increased ecosystem productivity. Phenological shifts can also lead to shifts in the timing of species interaction. This can affect established interdependencies such as between plants and their pollinators or in predator-prey relationships. This in turn impacts ecosystem structure and functions and can pose a threat to indigenous animal and plant species – or prompt an influx of new species.



Alt-Text:

The diagram shows the indicator “length of the vegetation period”. The figure is explained in greater detail in the text above.



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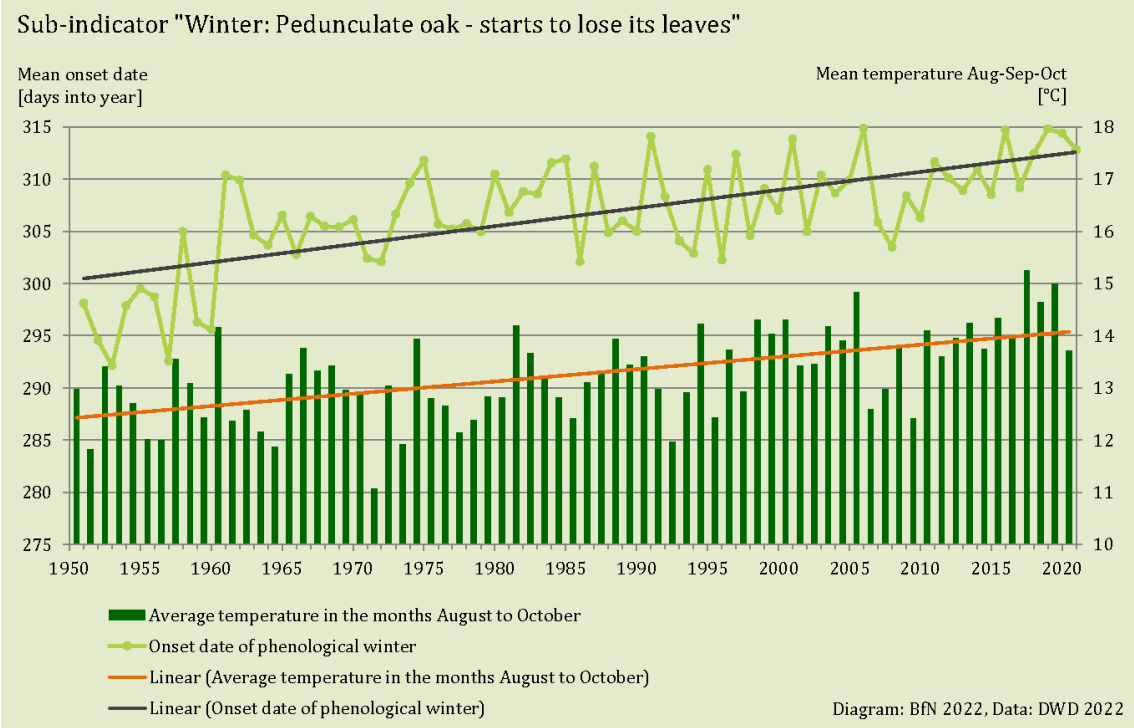
The diagram shows the sub-indicator “Spring: Coltsfoot – first flowering”. The figure is explained in greater detail in the text above.



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The diagram shows the sub-indicator “Winter: Pedunculate oak – starts to lose its leaves”. The figure is explained in greater detail in the text above.

Thematic areas

B 3.2 Climate change, C 11 Biodiversity and climate change

Definition

The indicator represents changes in the length of the vegetation period and the shift in the onset of phenological spring and winter due to climate change.

Qualitative target

It is essential to counteract a further extension of the vegetation period and further shifts in the phenological seasons by pursuing climate change mitigation measures.

Core assessment

The period 1951 to 2021 shows a marked increase in the length of the vegetation period by about 23 days to most recently 238 days (linear trend). This is a result of an earlier onset of spring in combination with a later onset of winter.

2.5 Public awareness

2.5.1 Awareness of biodiversity

Preserving biodiversity in the long term requires not only great efforts on the part of government actors, but also broad approval and participation in society. People in Germany should be aware that biodiversity relates both to the diversity of species and ecosystems as well as diversity at genetic level. They should also be convinced of the importance of biodiversity as the foundation of life for current and future generations and adapt their behaviour accordingly. Everyone should feel a sense of personal responsibility for biodiversity conservation.

Both the Convention on Biological Diversity (CBD) and the National Strategy on Biological Diversity highlight the great importance of public education and awareness. Article 13 of the CBD "The Contracting Parties shall […] promote and encourage understanding of the importance of, and the measures required for, the conservation of biological diversity, as well as its propagation through media, and the inclusion of these topics in educational programmes […]". In the National Strategy on Biological Diversity, the Federal Government states: "Activities to conserve biological diversity need the support of society. To this end, action-oriented learning is needed, both in the educational sector and in all other spheres of life" (BMU 2007: 61).

[Margin column: The indicator represents public awareness of biodiversity.]

Indicator

The indicator represents awareness of biodiversity in the German-speaking resident population aged 18 or over. Awareness of the term "biodiversity" (sub-indicator "knowledge"), appreciation of the value of biodiversity (sub-indicator "attitude") and the willingness to work for biodiversity conservation (sub-indicator "motivation") are surveyed and combined to form an overall indicator.

The following target value for the indicator is derived from specifications in the National Strategy on Biological Diversity: By 2015, at least 75% of the population has an awareness of biodiversity that is at least sufficient for all three sub-indicators. The overall indicator assesses the degree to which this target has been achieved.

[Margin column: "In the year 2015, at least 75% of the population will rate the conservation of biological diversity as one of the top priorities for society. The significance of biodiversity is firmly anchored in social consciousness. Human activity is increasingly tailored to this realisation, leading to a significant decline in the pressures on biological diversity." (BMU 2007: 60)]

Composition

The data for the indicator is based on representative surveys of approximately 2,000 people over the age of 18 selected from the German-speaking residential population. The number of people surveyed is sufficient to allow a comparison of sub-groups, such as people with high or low formal education, to determine their awareness of biodiversity. The surveys are incorporated into the nature awareness studies (Naturbewusstseinsstudien) published jointly by the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) and the Federal Agency for Nature Conservation (BfN). The first comprehensive nature awareness study was conducted in 2009 and others have followed in a two-year cycle. The results of the 2021 study were published by the BMUV and the BfN at the start of 2023.

The survey consists of two questions on knowledge, seven on attitudes and six on motivation. The three sub-indicators are first calculated separately. The value of each sub-indicator is the percentage of people whose answers are considered sufficient or better in relation to the targets on awareness-raising in the National Strategy on Biological Diversity. An overall indicator is then formed that shows percentage of survey respondents who meet the requirements in all three sub-areas and thus have at least sufficient awareness of biodiversity. As a result, the lowest value among the three sub-indicators determines the value of the overall indicator.

In 2009 and 2011, the indicator and the three sub-indicators were calculated without weighting the data. From 2013 onwards, the data was weighted to compensate for minor deviations of the sample from the statistical population and thus improve the representativeness of the results. This change in methodology does not affect the basic comparability of data in the time series.

[Margin column: The following recommendations to improve awareness of biodiversity are based on the targets and measures in the National Strategy on Biological Diversity and should be implemented in the near future:

The importance of the conservation and sustainable use of biodiversity should be more firmly established as an important educational subject than has previously been the case. To reach the broadest possible cross-section of the population, educational programmes need to be expanded by many providers to meet the needs and realities of various target groups.

The value of biodiversity needs to be more effectively conveyed and personal motivation to engage in biodiversity conservation increased using the full range of modern communication channels specifically directed to different target groups.]

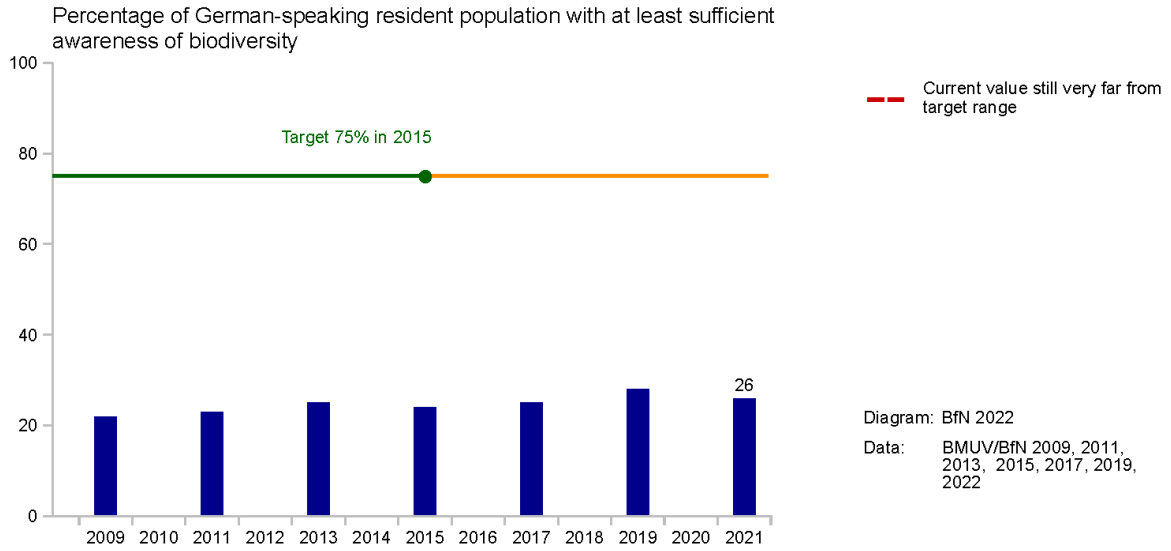
Assessment

According to the latest survey findings from autumn 2021, 26% of the German-speaking resident population aged 18 or over has at least sufficient knowledge and a positive attitude to biodiversity and express a similar level of motivation. Following an increase of 3% between 2017 and 2019, the value of the overall indicator has again decreased by 2% to 28%. The overall indicator is thus still very far from the target value and there is no stable trend in relation to the target. Between 2009 and 2021, the values of the overall indicator fluctuated by a maximum of six percentage points. The differences between the values are not statistically significant.

A more varied picture emerges when the sub-indicators are considered separately. Of the respondents surveyed in 2021, 48% know and understand the term “biodiversity” (knowledge indicator). Some 55% of respondents have positive attitudes to biodiversity (attitude indicator) and 53% are motivated to adapt their behaviour to promote biodiversity conservation (motivation indicator). Looking at the trend for all three sub-indicators, the attitude indicator decreased by five and the motivation indicator by ten percentage points compared with the previous survey in 2019 (attitude indicator 2019: 60%, motivation indicator 2019: 63%). It is interesting to note, however, that this does not apply for the knowledge indicator. Compared with 2019 (44%), this has increased again, to 48% – the highest value measured so far. Overall, it can be said that all three sub-indicators are still far from the target value of 75% and in some cases show a downward trend.

Suitable measures are thus required to promote awareness in all three dimensions of the awareness indicator. Education and information programmes need to be directed to various target groups and be specifically adapted to their particular requirements and interests. Whether someone knows the term “biodiversity” and understands what it means is largely determined by social standing: people from less well-off social milieus are much less likely to know what the term means. Personal attitudes and motivation to engage in biodiversity conservation are likewise weaker in such milieus. The National Strategy on Biological Diversity contains a wide range of public awareness, education and information measures, which, if consistently implemented, will contribute to improving awareness of biodiversity.

Awareness of biodiversity



Alt-Text:

The diagram shows public awareness of biodiversity as a percentage. The target of 75% for 2015 has not been met so far. In 2021, the figure stood at 26%.

Thematic areas

B 5 Public awareness, C 14 Education and information

Definition

The indicator represents awareness of biodiversity in the German-speaking resident population aged 18 or over in the three sub-areas of knowledge, attitude and motivation.

Target

By 2015, at least 75% of the population has an awareness of biodiversity that is at least sufficient for all three sub-areas (knowledge, attitude and motivation).

Core assessment

In 2021, 26% of the population has at least sufficient awareness of biodiversity. Compared with 2019, the current value has decreased by 2% and remains very far from the target value. In light of this, greater effort is needed to convey the importance of biodiversity to various target groups.

3 Overall assessment

On the pages that follow, key information on the 18 indicators of the 2007 National Strategy on Biological Diversity is outlined again in table format with data until September 2022. For a total of 13 indicators with quantitative target values, a level of target achievement (status) can be given, which is calculated from the distance between the last reported data point and the target value.

Status	Target achievement level	Indicators
++	**≥ 90%** The current value is within the target range.	• Landscape dissection • Sustainable forestry
+	**80% to < 90%** The current value is close to target range.	
–	**50% to < 80%** The current value is still far from target range.	• Species diversity and landscape quality • Conservation status of Habitats Directive habitat types and species • Status of floodplains • High nature value farmland • Agricultural nitrogen surplus • Eutrophication of ecosystems
––	**< 50%** Current value still very far from target range	• Endangered species • Ecological status of water bodies • Increase in land used for settlements and transport infrastructure • Organic farming • Awareness of biodiversity
	No identifiable status	• Invasive alien species • Protected areas • Agri-environment-climate measures (AECMs) • Genetic diversity in agriculture • Length of the vegetation period

The values of 11 indicators with a quantified target value are still far or very far from the target range. Based on the data available the most recently reported figures for the indicators are several years old. For the “Conservation status of Habitats Directive habitat types and species”, “Status of floodplains”, “Landscape dissection” and “Genetic diversity in agriculture” indicators, no more recent data is available than the data already published in the 2019 Indicator Report (BMU 2020) and the 2021 Progress Report (Rechenschaftsbericht, BMUB 2021). All other indicators are reported using more recent data.

For the “Landscape dissection” indicator, the last value reported from 2015 is within the target range. However, that last value reported had fallen below the value for 2005. The current value of the “Sustainable forestry” indicator is within the target range. The target values for the “Ecological status of water bodies”, “High nature value farmland” and “Awareness of biodiversity” indicators were meant to be reached in 2015, but have still not been met. The target value for the “Sustainable forestry” indicator is still based on 2010. The remaining target values, if they are linked to a specific target year, relate to 2020 or 2030.

Trend	Key	Indicators
	Statistically significant trend towards target	• Protected areas • Increase in land used for settlements and transport infrastructure • Organic farming • Agricultural nitrogen surplus • High nature value farmland
	No statistically significant trend (no significance for rising or falling trend)	
	Statistically significant trend away from qualitative target or specific target value	• Species diversity and landscape quality • Length of the vegetation period
	No identifiable trend	• Endangered species • Conservation status of Habitats Directive habitat types and species • Invasive alien species • Ecological status of water bodies • Status of floodplains • Landscape dissection • Agri-environment-climate measures (AECMs) • Genetic diversity in agriculture • Eutrophication of ecosystems • Sustainable forestry • Awareness of biodiversity

Trend analysis was possible for a total of seven indicators. For a further ten indicators, there are not yet sufficient data points to allow a trend analysis, while an overall trend cannot be identified for the “Sustainable forestry” indicator due to the structure of the data. Both for the newly developed indicators and for those for which data is only collected at intervals of several years, there are so far only a small number of data points, and it will be many years before a reliable trend analysis can be performed.

The trend analysis is mainly positive for the seven indicators assessed. Five indicators show a statistically significant trend towards their respective quality target or specific target value. By contrast, the “Length of the vegetation period”

and “Species diversity and landscape quality” indicators display a statistically significant trend away from the target value. It becomes clear that if the current trend continues, the targets for 2020 or 2030 will likely not be met unless additional efforts are made.

Very low levels of target achievement are evident for endangered species, the ecological status of water bodies, the increase in land used for settlements and transport infrastructure, organic farming and awareness of biodiversity. However, in the past ten reporting years, the “Organic farming” and “Increase in land used for settlements and transport infrastructure” indicators do show statistically significant trends towards their targets. With regard to the ecological status of water bodies, it should be noted that, relative to the very ambitious goals of the National Strategy on Biological Diversity, the Water Framework Directive allows for extensions of the deadline up to 2027.

The measures taken so far are not enough to achieve all aspects of the goals set in the National Strategy on Biological Diversity. As the trends in the various indicators clearly show, the trend has yet to be reversed in some cases and target achievement is progressing very slowly in others. While work has already started on many of the measures specified in the action areas of the National Strategy on Biological Diversity, in many cases such measures have yet to deliver positive results. This is due, on the one hand, to the fact that it has not yet been possible to reduce impacts to a sufficient extent. On the other hand, populations of animal and plant species as well as habitats often require long periods of time for regeneration, which is why successes can only be reflected in the values of the indicators on the status of species and habitats after a considerable amount of time. In addition, some indicators are only updated at relatively long intervals, and for other indicators it takes a long time to compile the data, so that the last reported values sometimes lie several years in the past. For Germany, biodiversity conservation remains a key challenge for the future.

Indicators

The results of the assessment based on the data available up to September 2022 are presented in a table of indicators on the following pages. The indicators are grouped by components of biological diversity, settlements and transport infrastructure, economic activities, climate change and public awareness. The information provided for each indicator consists of the measured or observed parameter, the last value reported, goal/target value, status (level of target achievement) and trend. For more details on how the status and trend of the indicators are determined, as well as an explanation of the symbols, see the introduction to section 2 and the key to the indicator table.

The table also provides additional information on the use of the indicators in other indicator systems (where applicable in modified form): Streamlining

European Biodiversity Indicators (SEBI), German Sustainable Development Strategy (DNS), Kernindikatorensystem Umwelt (KIS) (c), Länderinitiative Kernindikatoren (LiKi) (Länder Initiative for a Core Set of Indicators) and the indicator system for the German Strategy for Adaptation to Climate Change (DAS). The right-hand column contains the core assessment for each indicator. It gives an overview of the indicator trend and action needed in the corresponding thematic area.

Key: Status

++	Target achievement ≥ 90%	Current value within target range
+	Target achievement 80% bis < 90%	Current value close to target range
-	Target achievement 50% bis < 80%	Current value still far from target range
--	Target achievement < 50%	Current value still very far from target range

Key: Trend

↗	Statistically significant trend towards target
~	No statistically significant trend (no significance for rising or falling trend)
↘	Statistically significant trend away from target

Key: Indicator systems

SEBI Streamlining European Biodiversity Indicators

DNS Nationale Nachhaltigkeitsstrategie (German Sustainable Development Strategy)

KIS Kernindikatorensystem Umwelt (Environmental Key Indicator System)

LiKi Länderinitiative Kernindikatoren (Länder Initiative for a Core Set of Indicators)

DAS Deutsche Anpassungsstrategie an den Klimawandel (German Strategy for Adaptation to Climate Change)

Data from September 2022

Indicator		Measured or observed parameter	Last reported value	Goal/target value	Status	Trend	Indicator system	Core assessment
Components of biological diversity								
1	Species diversity and landscape quality	Index (measured as a %) of population sizes throughout Germany of selected representative bird species in primary habitat and landscape types	75 % (as of: 2019)	100 % in 2030	–	↘	DNS, KIS, LiKi, SEBI	In the past ten reporting years (2009 to 2019), the indicator value for the overall indicator has deteriorated significantly. The period in question saw a statistically significant trend away from the target. The aggregate value of the indicator and the values for the sub-indicators for farmland, inland waters, coasts and seas are far from the target, while the sub-indicators for forests and settlements are close to the target range. Only the sub-indicator for settlements shows a statistically significant trend towards the target. If the trend continues unchanged, the target of 100% for the overall indicator and the sub-indicator for farmland cannot be achieved in 2030 without considerable additional effort in all relevant policy areas, at national, Land and local government level.
2	Endangered species	Index (measured as a %) based on the classification of selected species groups into categories used in German national red lists	19 % (as of: 2022)	11 % in 2020	– –	–	KIS, SEBI	For the year 2022, the indicator value provisionally calculated for 70 groups only is 19%. Major species conservation efforts are needed to achieve the target of 11%.

Indicator		Measured or observed parameter	Last reported value	Goal/target value	Status	Trend	Indicator system	Core assessment
3	Conservation status of Habitats Directive habitat types and species	Index (measured as a %) of the weighted conservation status of the Habitats Directive habitat types and species in Germany's three biogeographical regions	43 % (as of: 2019)	80 % in 2020	–	–	SEBI	On the basis of the 2019 Habitats Directive report (2013-2018 reporting period), the indicator value stands at 43%. This is still far from the target range. Efforts to improve the conservation status of Habitats Directive habitat types and species must thus be significantly intensified.
4	Invasive alien species	The number of Union list invasive alien species separated into the number of species in the early stage of invasion (first sub-indicator) and the number of species that since 2010 have overcome the early stage of invasion and are now considered widely spread (second sub-indicator).	15/0 species (as of: 2022)	No further increase in invasive alien species	–	–	KIS, SEBI	Immediate measures must be taken against 15 Union list invasive alien species that were in the early stage of invasion in 2022. Since 2010, none of the species in the first sub-indicator has been classified as widely spread in Germany.
5	Protected areas	Total size of strictly protected areas (nature conservation areas and national parks) as a percentage of Germany's land area	4.6 % (as of: 2020)	–	–	↗	KIS, LiKi, SEBI	The total size of strictly protected areas increased between 2000 and 2020 from 3.2% to 4.6% of Germany's land area.

Indicator		Measured or observed parameter	Last reported value	Goal/target value	Status	Trend	Indicator system	Core assessment
6	Ecological status of water bodies	Proportion of water bodies – sections of rivers, streams, lakes, transitional and coastal waters – with good or high ecological status as a percentage of all water bodies assessed	9 % (as of: 2021)	100 % in 2015	−−	–	LiKi, SEBI	Only 9% of water bodies achieved good or high ecological status in 2021. The most frequent causes of impairment are changes in the structure of water bodies and high levels of nutrient inputs from agriculture.
7	Status of floodplains	Index (measured as a percentage) based on the status assessment of all river floodplains included in the Status Report on German Floodplains (Auenzustandsbericht)	17 % (as of: 2021)	29 % in 2020	−	–	–	Overall, Germany's major river floodplains are severely modified (indicator value 17% in 2021). As a result, considerable effort with more and larger-scale measures will continue to be necessary to protect and develop biodiversity in river floodplains.
Settlements and transport infrastructure								
8	Increase in land used for settlements and transport infrastructure	Average increase in land used for settlements and transport infrastructure in ha per day (four-year rolling average)	54 ha (as of: 2020)	< 30 ha in 2030	−−	↗	DNS, KIS, LiKi	The four-year rolling average fell from 129 ha per day in 2000 to 54 ha per day in 2020. Despite the positive trend, the current value is still very far from the target. This means that existing instruments and measures to reduce land take need to be rigorously applied, updated and supplemented with new instruments.

Indicator		Measured or observed parameter	Last reported value	Goal/target value	Status	Trend	Indicator system	Core assessment
9	Landscape dissection	Proportion of undissected low-traffic areas with a minimum size of 100 km2 as a percentage of Germany's area and effective mesh size (M_{eff})	23.5% (as of: 2015)	25.4% (no year specified)	++	–	KIS, LiKi, SEBI	The proportion of undissected low-traffic areas with a minimum size of 100 km^2 decreased from 26.5% to 23.5% between 2000 and 2015. In the same period, the effective mesh size (M_{eff}) decreased from 84 km^2 to 80 km^2. Germany has well-developed transport infrastructure so that the focus of future investments will be on maintaining the existing infrastructure.
Economic uses								
10	Agri-environment-climate measures (AECMs)	Area of land on which agri-environment measures (from 2014 agri-environment-climate measures (AECMs)) have been implemented and the amount of funding granted	5.2 m ha 1037 m euros (as of: 2020)	–	–	–	KIS	In the funding period starting in 2014, the significantly increased funding was concentrated on far fewer funded areas from 2016 onwards. This was due to cost-intensive measures that are considered to have the greatest positive impact on the agricultural environment.
11	Organic farming	Organically farmed land as a percentage of the total land used for agriculture	9.6 % (as of: 2020)	30 % in 2030	−−	↗	DNS, KIS, LiKi, SEBI	Since 1999, the percentage of organically farmed land has increased continuously (9.6% in 2020). The 30% target is, however, far from being reached.

Indicator		Measured or observed parameter	Last reported value	Goal/target value	Status	Trend	Indicator system	Core assessment
12	High nature value farmland	High nature value (HNV) farmland as a percentage of total land used for agriculture	13.4 % (as of: 2021)	20 % in 2015	–	↗	LiKi SEBI	In 2021, the percentage of agricultural land of exceptionally high nature value was 2.8%, of very high 5.1% and of moderately high 5.5% (HNV farmland with a total percentage of 13.4%). To achieve the 20% target, targeted measures must still be taken to promote biodiversity in agricultural landscapes, paying particular attention to areas of arable and fallow land.
13	Genetic diversity in agriculture	Percentage of endangered indigenous farm animals (horse, cattle, pig, sheep and goat breeds)	70 % (as of: 2019)	Reduction in the endangerment to farm animal breeds	–	–	SEBI	In 2019, the percentage of endangered indigenous breeds is very high at slightly over 70%. Targeted measures must be taken to reduce the level of endangerment.

Indicator		Measured or observed parameter	Last reported value	Goal/target value	Status	Trend	Indicator system	Core assessment
14	Agricultural nitrogen surplus	Difference between nitrogen inputs and outputs in agriculture (overall surplus based on a farm gate balance) – five-year rolling average	87 kg/ha*a (as of: 2018)	70 kg/ha per year (five-year rolling average) 2028-2032	–	↗	DNS, KIS, LiKi, SEBI	From 1992 to 2018, the yearly nitrogen surplus fell from 116 kg/ha to 87 kg/ha (five-year rolling average). To achieve the target of 70 kg/ha in the five-year average over the period 2028 to -2032, it is necessary to increase the efficiency of nitrogen fertiliser application, take further measures to reduce nitrogen inputs and develop measures for feeding animals that use nitrogen more efficiently.
15	Eutrophication of ecosystems	Percentage of land where ecosystem-specific critical loads of nutrient nitrogen are exceeded (*Critical Loads of Nutrient Nitrogen*)	69 % (as of: 2019)	52 % in 2030	–	–	DNS, KIS, SEBI	In 2019, 69% of the assessed land of sensitive ecosystems exceeded the critical loads. To reduce the share of land with increased nitrogen inputs to 52% by 2030 and to continue the reduction of nitrogen inputs of recent years, further efforts are needed, especially to achieve a significant and lasting reduction of ammonia emissions from agriculture.
16	Sustainable forestry	Proportion of forest area certified according to PEFC or FSC as a percentage of total forest area	78.7%/12.1% (as of: 2021)	80 % in 2010	++	–	KIS	In 2021, 78.7% of all forest area was PEFC-certified and 12.2% was FSC-certified. The aim is to further increase the overall share of forest area certified to high-quality ecological standards.

Indicator		Measured or observed parameter	Last reported value	Goal/target value	Status	Trend	Indicator system	Core assessment
Climate change								
17	Length of the vegetation period	Changes in the length of the vegetation period and the shift in the onset of phenological spring and winter due to climate warming	238 days (as of: 2021)	No further lengthening of the vegetation period	–	↘	LiKi, DAS	The period 1951 to 2021 shows a marked increase in the length of the vegetation period by about 23 days to most recently 238 days (linear trend). This is a result of an earlier onset of spring in combination with a later onset of winter.
Public awareness								
18	Awareness of biodiversity	Proportion of the German-speaking resident population aged 18 or over meeting certain minimum requirements in relation to biodiversity in the three sub-areas of knowledge, attitude and motivation	26 % (as of: 2021)	75 % in 2015	−−	–	SEBI	In 2021, 26% of the population has at least sufficient awareness of biodiversity. Compared with 2019, the current indicator value decreased by 2% and remains very far from the target. In light of this, greater effort is needed to communicate the importance of biodiversity appropriately to various target audiences.

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