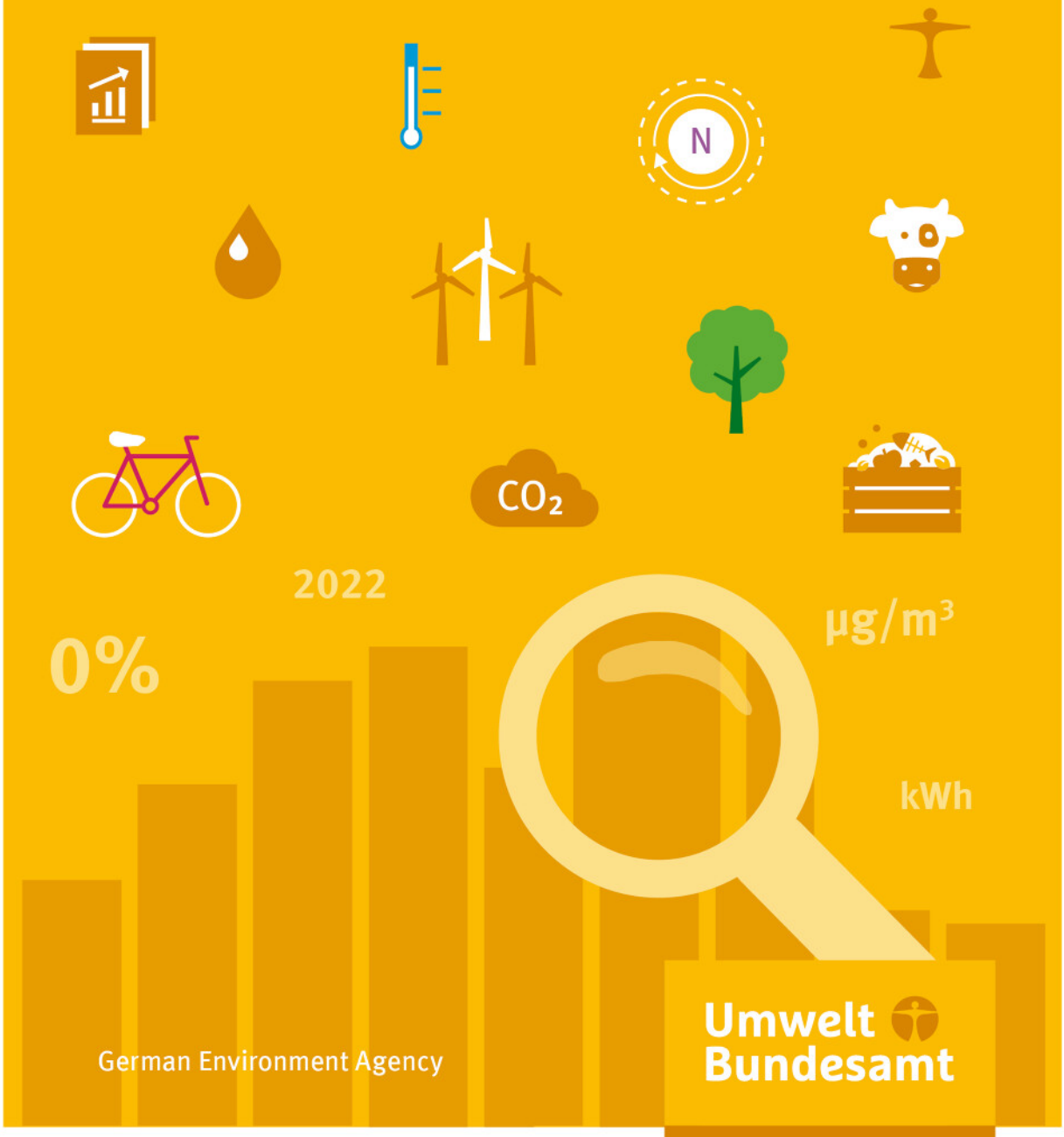
Environmental monitor 2024

Data on the Environment



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May 2024

Data on the Environment

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Preface

Dear readers,

With the Environmental Monitor 2024, the German Environment Agency is publishing a condensed picture of the state of the environment and the progress made in achieving long-term environmental goals, such as climate protection, air pollution control and water protection. The Environmental Monitor covers ten key topics and focuses on the links between the state of the environment and the areas of policy action.

The expansion of renewable energies is progressing and the targets for 2022 have been achieved. However, further growth in wind power and solar installations is necessary to remain on target. The continued rise in employment figures in the renewable energy sector is a good sign of this.

Despite significant one-off effects, greenhouse gas emissions also fell considerably as a result. Other reasons for this decline were lower fossil energy production and, above all, lower demand for energy from industry and consumers in 2023.

2023 highlighted the progression of climate change like no other year before it. Record temperatures felt by us all, extreme weather events and melting glaciers and polar ice caps dominated the national and international news. Ecosystems and biodiversity are increasingly under threat, and agriculture and forestry are facing drastic challenges.

The current crises and wars and the indicators in our Environmental Monitor 2024 show how important it is to invest in environmental protection, climate protection and resource conservation, but also in justice and fairness. This is the only way we can make society and the economy fit for the future.

Dirk Messner

President of the German Environment Agency

Environmental monitor – At a glance

Source: German Environment Agency, April 2024
Design: Studio GOOD

Environmental Monitor – Are we meeting our environmental goals?

How has the state of the environment developed over the last five years? How can progress towards environmental policy targets be assessed? The Environmental Monitor provides answers to these questions and thus provides a reflection of the transformation towards sustainability. Are we meeting our climate targets, what is the status of the expansion of renewable energies, how polluted are our waters? – are just a few examples. Altogether, the Environmental Monitor covers 10 topics with 30 environmental indicators. Four color categories (green, yellow, orange, red) provide information on the extent to which development has been successful to date. The development in the recent past is evaluated up to the latest value. The assessment is based on the extent to which the indicator is on track, i.e. has moved in the direction of a "target-compliant" development. A detailed description of the methodology can be found on p. 98.

Priority was given to indicators for the Environmental Monitor that are anchored in strategies (e.g. sustainability strategy), directives (e.g. Water Framework Directive) or laws (e.g. Climate Protection Act). Another selection criterion was the existence of explicit quantitative or qualitative targets.

Rating	EXPLANATORY NOTE
	Green indicates that the indicator is currently on a successful course or only deviates from it by a maximum of 5%. Progress over the last five years has been successful and is between 95% and 100%. For indicators with a directional target, green indicates that this past development has headed in the desired direction both in the long term and in recent years.
	Yellow indicates that the indicator is currently deviating slightly from the successful course. Progress in the last five years was slightly too low and lies between 80% and 95%. For indicators with a directional target, yellow indicates that the development in the past has not been as desired over the long term, but has been moving in the desired direction in recent years.
	Orange indicates that the indicator is currently deviating significantly from a successful course. Progress in the last five years was clearly too low and is between 30% and 80%. In the case of indicators with a directional target, orange indicates that the past development has been as desired over the long term, but has no longer been moving in the desired direction in recent years.
	Red indicates that the indicator is currently deviating very significantly from the course. Progress over the last five years has been below 30% or even negative if the indicator has moved away from the target. For indicators with a directional target, red indicates that the indicator has developed in the opposite direction in the past, both in the long term and in recent years.

Assessment of the Monitor Indicators

In the table you will find explanations on the development and evaluation of the environmental monitor indicators. The four color categories of the environmental monitor also provide a quick overview of the extent to which the environmental targets set are likely to be achieved. Detailed information on the indicators can be found from page 18 onwards. Information on the evaluation methodology can be found from page 98 onwards.

Land, soil, terrestial ecosystems

Land-take for settlements and transport infrastructure

The Integrated Environmental Program 2030 formulates the goal of limiting the increase in settlement and transport areas to 20 ha per day by 2030. From 2017 to 2022, the increase in area fell from 58 to 52 ha/day, which corresponds to an average decrease of 1.1 ha per year. A greater reduction would have been necessary for a successful development towards the target value. Achieving a limit of 20 ha/day is very challenging and requires further measures.

Nitrogen eutrophication

69 % of the areas of sensitive ecosystems exceed the eutrophication load limit. The share of areas has fallen by 7 percentage points since 2010.
However, a greater reduction would have been necessary for a successful development towards the target value. In order to achieve the target, efforts to reduce nitrogen inputs must therefore be significantly increased.

Species diversity and landscape quality

A large diversity of animal and plant species is an essential prerequisite for an efficient ecosystem and forms an important basis for human life. In the last five years of the data series, the indicator continued to show a significant deterioration. In 2019, it was only at around 75% of the target value. The main reasons for this are intensive agricultural use, landscape fragmentation and urban sprawl, sealing of surfaces and large-scale substance inputs (e.g. nutrients, pesticides or acidifiers).

Two factors are relevant for the different assessment of the "emissions of air pollutants" indicator compared to "population exposure to particulate matter". Firstly, the emissions indicator is made up of several air pollutants, the development of which varied during the period under review. Secondly, the NEC Directive (EU) 2016/2284 from 2016, on which this indicator is based, did not take into account the new WHO guideline values from 2021. From a health protection perspective alone, the targets of the NEC Directive and thus the German sustainability strategy for 2030 need to be adjusted accordingly.

Emission of air pollutants

Germany has to substantially reduce the five air pollutants sulphur dioxide (SO_2), nitrogen oxides (NOX), ammonia (NH_3), volatile organic compounds (NMVOC) and particulate matter (PM2.5) between 2005 and 2030. The European National Emission Reduction Commitments (NEC) Directive defines percentage reduction commitments for each pollutant compared to 2005. The German Sustainability Strategy derives from this the target of a 45% reduction in 2030 compared to 2005 on average across the five pollutants. Progress over the last five years has been positive, and the NEC commitments for 2020 have also been achieved. However, the relevant scenarios show that the reduction commitments in 2030 can only be achieved with additional measures.

Air quality in agglomerations

The pollution in German metropolitan areas clearly exceeds the current recommendations of the World Health Organization (WHO, 2021) for the pollutants particulate matter, nitrogen dioxide and ozone. Ozone pollution has even increased in recent years.
Progress over the last five years has therefore been insufficient. In the future, further air pollution control measures will be needed to reduce pollution to a greater extent.

Population exposure to particulate matter (PM2.5)

Between 2010 and 2021, almost the entire population was exposed to particulate matter levels above the current WHO guideline value of 5 µg/m3. However, a comparison with interim target 4 of the WHO recommendations (10 µg/m3) shows an overall decrease in particulate matter pollution in Germany. In the interests of health protection, further measures are therefore required to reduce emissions of particulate matter and its precursors in order to bring particulate matter pollution in Germany even closer to the current WHO guideline value. As part of the revision of the EU Air Quality Directive, a stricter EU limit value for particulate matter (PM2.5) is planned, which should be more closely aligned with the current WHO guideline value.

Water

Nitrate in groundwater

The European Nitrates Directive requires Germany to prevent exceeding the limit value for nitrate of 50 milligrams per liter. The limit has been exceeded every year since 2008. In 2022, this was the case at 16% of measuring points. Progress in recent years has been insufficient. The effects of measures taken (e.g. amendment of the Fertilizer Ordinance) will only become apparent in the future.

Plastic waste in the North Sea

Large quantities of plastics continue to end up in the oceans, where they are only broken down very slowly and cause massive damage to ecosystems. Plastic parts are mistaken by animals for food and can injure and clog their digestive organs after being eaten, which can lead to their death. Around 49% of fulmars found in German North Sea areas have more than 0.1 grams of plastic and other plastic parts in their stomachs. According to a quality target agreed within the framework of the OSPAR Convention (2008), this should occur in a maximum of 10% of birds.

Ecological status of rivers

Only around 8% of German streams and rivers were in at least "good" ecological status or had at least good ecological potential in 2021. According to the European Water Framework Directive, all rivers should be in at least "good" ecological status or potential by 2015 (with an extension until 2027). The time until 2027 must be used to achieve the ambitious targets. The measures already taken need more time to take effect. Also, further measures are required.

Resource Conservation resoources and waste

Total raw material productivity

The extraction and consumption of primary raw materials is sometimes associated with massive negative environmental impacts. One of the aims of the German government's sustainability strategy is therefore to use raw materials as sparingly and efficiently as possible and to increase their productivity by 1.6% annually by 2030. According to calculations by the Federal Statistical Office, the progress of the indicator has so far fallen short of this objective. In order to achieve the target, higher growth rates will therefore be necessary in future to increase material efficiency. It is necessary to promote the necessary, economical use of primary raw materials in order to significantly reduce the raw material footprint.

Raw material footprint

The production, extraction and processing of primary raw materials have a high environmental impact. If the global per capita demand for raw materials were as high as in Germany, this would place a very heavy burden on global ecosystems. That is why the German government aims to reduce the raw material footprint. Compared to 2010, the raw material footprint has only decreased slightly. A clear trend towards the desired direction has not emerged in recent years either.

Amount of waste – municipal waste

The volume of municipal waste has not shown a clear trend since 2010, but rather a fluctuating development. In the last three years, municipal waste has risen slightly and is higher in 2021 than in 2010. The goal of waste prevention in the sense of reducing waste volumes at all stages of the value chain is not being achieved.

Climate

Greenhouse gas emissions

Germany's greenhouse gas emissions are to be reduced by at least 65% by 2030 compared to 1990 levels. Greenhouse gas neutrality is to be achieved by 2045. A reduction of 46.1 % was recorded by 2023. Progress in the last five years has been sufficient; the set targets can be achieved. Also current projections show that the current gap in target achievement can be closed by 2030.

Global surface temperature

The last nine years have been the warmest years worldwide since 1850.
In order to prevent a dangerous disruption of the climate system, the global increase in air temperature should be limited to 1.5 degrees compared to pre-industrial times if possible (Paris Agreement). In any case, the increase should be limited to well below 2 degrees. This can only be achieved if global greenhouse gas emissions are reduced quickly and drastically.

Hot days

Rising temperatures can have a detrimental effect on health. The number of hot days (regional average) above 30 degrees increased until 2023, albeit with strong annual fluctuations. 2003, 2015 and 2018 were the years with the most hot days in Germany. As climate change progresses, more hot days are to be expected in the coming decades.

Energy

Final Energy Consumption

The "Projection Report 2023 for Germany" analyses the expected future development of final energy consumption in addition to the development of greenhouse gas emissions. The result: even if all the measures currently planned by the German government are implemented, the target of the Energy Efficiency Act would still be missed by a significant margin by 2030.

Renewable energies – Share in gross final energy consumption

In its "National Energy and Climate Plan" (NECP) in 2020, Germany committed to increasing the share of renewables in gross final energy consumption (BEEV) to 30% by 2030. The NECP also includes a target trajectory up to 2030. So far, the development of the share of renewables in the BEEV in Germany is close to the target trajectory. However, the European targets were recently increased significantly from 30% to 42.5% as part of the agreement on the revised Renewable Energy Directive. Germany will also be revising its targets significantly upwards in the near future. Achieving the new targets will be challenging.

Share of renewables in gross electricity consumption

In the "Projection Report 2023 for Germany", the expected future development of the share of renewables in gross electricity consumption was analyzed in addition to the development of greenhouse gas emissions. The report shows: The share of renewables could be over 80% in 2030. However, this assumes that Germany achieves the expansion targets of the EEG. It is becoming apparent that this will be a challenge, particularly in the field of wind power.

Private households and consumption

Global environmental footprint of consumption

In its sustainability strategy, the German government has set itself the goal of continuously reducing the global environmental impact of private households in the areas of energy consumption, CO_2 emissions and raw material consumption. Since 2010, the environmental impact in the areas of CO_2 emissions and energy consumption has fallen, while the consumption of raw materials has returned to the 2010 level. However, no stable downward trend has been evident in recent years.

Environmentally friendly consumption

In its sustainability strategy, the German government has set itself the goal of e nsuring that environmentally friendly products have a market share of 34% by 2030. The share of sales accounted for by products with state ecolabels has increased in the last five years, but progress has not yet been sufficient to achieve the target.

National Welfare Index

The gross domestic product is a measure of the economic performance of an economy. However, it does not reflect social welfare. Based on consumer spending, the National Welfare Index (NWI) takes into account a total of 21 welfare-creating and welfare-reducing activities. The NWI showed a positive upward trend from 2012 to 2022. In the latest year of the estimate, there was a sharp increase.

Environment and economy

Environmental management

The number of organisations, sites and employees registered under the Eco-Management and Audit Scheme (EMAS) is a measure of the distribution of sus -tainable production patterns in the economy. In its sustainability strategy, the German government has set itself the target of 5,000 EMAS-registered site s by 2030. In the last 5 years, an average of only 57 organisational sites have been added to EMAS every year. In December 2023, 2455 sites were registered. Progress to date is therefore far from sufficient.

Employment in the renewable energy sector

The increase in the use of renewable energies not only benefits climate protection, but also creates jobs in Germany. The number of jobs in the renewable energy sector has almost tripled since 2000. After a strong increase since 2000, employment has been declining since 2012. This was initially due to job losses in solar energy. Production in wind energy also fell sharply. In recent years, however, there has been a positive trend again. In 2022, the renewable energy sector employed 387,700 people. Growth was mainly due to the increased use of geothermal and solar energy.

Environmental costs of energy and road transport

Power and heat generation and transport activities pollute the environment among other things through the emission of greenhouse gases and air pollutants. This results in high consequential costs for society, for example through environmentally-related illnesses, damage to ecosystems or even buildings. After a particularly pronounced decline in environmental costs of 6.4% from 2019 to 2020, this trend did not continue in 2021. Environmental costs rose from 229.2 billion (bn) euros in 2020 to 241.5 bn euros in 2021.

Final energy consumption of transport

Harmful greenhouse gas emissions are closely linked to energy consumption in the transport sector. For this reason, final energy consumption in passenger and freight transport is set to fall by 15-20% by 2030 (sustainability strategy). However, final energy consumption in the transport sector stagnated at a high level with an upward trend until 2019. Due to the COVID-19 pandemic, energy consumption in passenger transport fell as a result of the drastic decline in passenger transport. However, it continued to rise in freight transport. In order to sustainably reduce the energy consumption of transport, more energy-efficient alternatives need to be promoted more strongly, transport demand needs to slow down or decrease and transport needs to shift to more environmentally friendly means of transport.

Population exposure to traffic noise

Traffic noise affects the lives of many people in Germany and can have far-reaching effects on health. In 2022, a good 17% of the population was affected by traffic noise levels at night, which can cause cardiovascular diseases. During the day it was around 25%. Compared to 2017, the situation has barely changed. The European Commission's zero-pollution target is therefore very likely to be missed.

Environmentally friendly passenger transport

Bus, railway, walking and cycling make up environmentally friendly passenger transport. The share of total passenger transport has risen slightly between 2010 and 2019. Due to COVID-19, it fell to just under 18% in 2020 and remained at the same level in 2021. In order to keep the environmental impact and energy consumption of passenger transport low, as envisaged in the energy concept, this share needs to be increased. At the same time, the transport performance of motorised private transport in particular needs to decrease in order to achieve a sustainable effect in reducing energy consumption. Progress has not yet been sufficient.

Agricultural nitrogen surplus

The nitrogen surplus per hectare of agricultural land fell from 95 kilograms per hectare of agricultural land per year (kg/ha*a) to 82 kg/ha*a on a 5-year moving average between 2010 and 2018. If the trend of the last 10 years continues, the German Sustainability Strategy's goal of reducing the nitrogen surplus to an average of 70 kilograms per hectare between 2028 and 2032 will be achieved. The reasons for the increased decline in the surplus in recent years are more effective legislation, lower animal numbers, drought years and reduced sales of mineral fertilizers. However, in order to achieve the goals associated with the surplus – eutrophication, nitrate in groundwater and emissions of air pollutants from agriculture - it is crucial that the surpluses not only fall as a nationwide average, but especially in the particularly polluted regions such as north-west Germany.

Organic farming

The proportion of agricultural land farmed according to the rules of organic farming has grown slowly but steadily over the last 5 years and will be 9.7% in 2022. However, this progress is not nearly enough to achieve the target of a 30% share by 2030. Higher increases will have to be achieved in the future.

Grasslands

Grassland is of great value for environmental protection and nature conservation. The loss of grassland was largely halted by the EU agricultural policy from 2014. Since then, the area of grassland has not fallen below the 2013 level. After decades of decline, the trend has recently reversed. Since 2013, the area of grassland has increased slightly again. The target can therefore currently be considered achieved.

01
Land, soil, terrestrial ecosystems

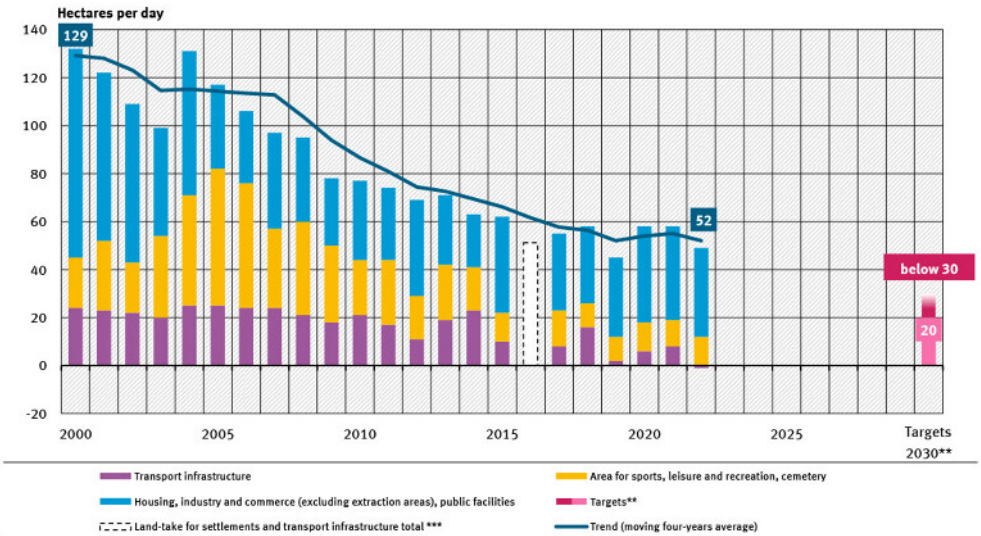
Land-take for settlements and transport structure

Nitrogen eutrophication

Species diversity and landscape quality

Land-take for settlements and transport infrastructure

Land-take for settlements and transport infrastructure*



* Land use survey is based on the evaluation of the states' (Länder) land registry. Data on increase in land-take for settlement and transport infrastructure have been distorted from 2004 due to a change-over in land registries (recoding land use types in course of digitalisation).
** Targets 2030: '30 minus X' hectares per day: German Sustainable Development Strategy, revised 2016; 20 hectares per day: Integrated Environmental Programme 2030
*** Since 2016, the distinction between "buildings and adjacent open areas" and "operating area excluding extraction areas" has become obsolete due to the switch from the automated property book (ALB) to the automated real estate cadastre information system (ALKIS). This means that time comparison is currently impaired and the calculation of changes is made more difficult. The settlement and traffic area determined after the changes contain largely the same types of use as before. Further information is available at www.bmu.de/WS2220#c10929.

Source: Values from Federal Statistical Office 2024, Increase in settlement and transport area (moving 4-year average) and increase of sub-types in settlement and transport area (yearly basis) (in German only)

At a glance

- Between 2019 and 2022, 52 hectares of land per day were newly dedicated to settlements and transport infrastructure.
- Originally, the increase was to fall to 30 hectares per day by 2020. According to the goals of the sustainability strategy, the daily increase now should be less than 30 hectares per day by 2030.
- The Integrated Environmental Programme of the Federal Environment Ministry specifies a reduction in the daily increase to 20 hectares per day by 2030.
- Additional actions are necessary in order to achieve these targets.

Indicator online (latest data, data download): http://www.uba.de/57125
Last updated: 15.03.2024

Environmental importance

The conversion of agricultural land, forests or grassland to settlements and transport infrastructure has significant environmental impacts. Much of the land is covered with buildings and other facilities or sealed to expand transport networks. This destroys the natural fertility of soils, thereby impeding future (re-)use for agriculture and forestry. Sealed surfaces (i.e. asphalted or paved) lose their ability to regulate the microclimate and are unable to mitigate the overheating of towns and cities in summer. In addition, the loss of these areas has an adverse effect on species diversity as the new settlements and transport infrastructure increase fragmentation of landscapes and reduce the size of habitats.

Furthermore, newly developed settlements and transport infrastructure generate additional traffic which in turn creates noise and pollution. Material consumption also increases for the construction of buildings and development infrastructure. New buildings and infrastructures have to be operated, thereby energy consumption increases as well.

Assessing the development

The EU's 'Roadmap for a Resource Efficient Europe' aims to reduce land use in such a way that by 2050 no more land is consumed in net terms (COM/2011/0571). The objectives of the sustainability strategy (BReg 2016) and the climate action programme 2030 (BReg 2019) specify that by 2030 less than 30 hectares per day should be newly designated as land for settlement and transport purposes. The 'Integrated Environmental Programme 2030' of the Federal Environment Ministry mentions a more ambitious target of 20 hectares per day for the year 2030 (BMUB 2016), as this figure should be achieved if a linear progress towards the net zero target for 2050 is made - as also intended in the 'Climate Action Plan 2050'.

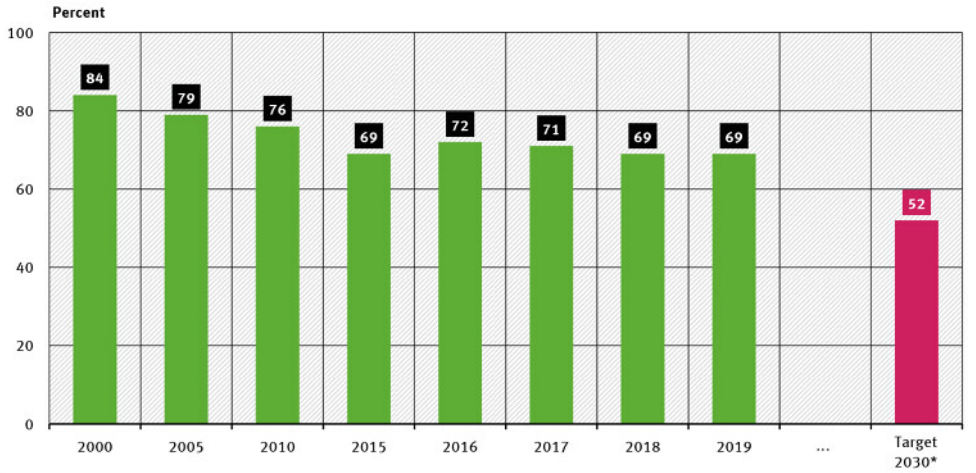
Between 2019 and 2022, the settlement and transport area increased by an average of 52 hectares per day. Since 2000, the daily increase in settlement and transport area has been roughly halved. The reasons for this were stricter regulations in building and planning law, greater efforts in the federal states and municipalities, subdued economic development and demographic change. These last few years, the trend has stagnated. Still, the target of the Integrated Environmental Programme of 20 hectares per day by 2030 can be achieved. However, maintaining the trend is challenging, as the slight increase in 2020 shows.

Methodology

The indicator shows the average increase in settlement and transport area in hectares per day. Settlement and transport areas include areas for housing, industry and commerce (excluding mining land), for public buildings, areas for sports, leisure and recreation (incl. cemetery areas) and traffic areas. The indicator is calculated annually by the Federal Statistical Office on the basis of the land use data reported by the Länder. In many cases these are subject to special effects and must be partially corrected by the Federal Statistical Office. Further information on this can be found in the 'Explanatory notes on the indicator Increase in settlement and transport area' (in German only).

Nitrogen eutrophication

Proportion of vulnerable ecosystems where critical loads for eutrophication are exceeded



* Federal Government's Strategy for Sustainable Development: The proportion of land affected by excess nitrogen deposition should fall by 35 % between 2005 and 2030. Based on a value of 79 % in 2005, this gives a target value of 52 % for 2030.

Source: according to data Kranenburg et al. (2024) in preparation PINETI-4, Final report. Modellierung und Kartierung atmosphärischer Stoffeinträge

At a glance

- 69 % of vulnerable ecosystems in Germany are threatened 2019 by excess nitrogen deposition.
- With the revised German Sustainable Development Strategy 2016, the Federal Government aims to reduce the proportion of these areas by 35 % until 2030. According to the current calculation basis, this results in a target value of 52 % by 2030.
- This target is feasible only if efforts to reduce air pollution are maintained.

Indicator online (latest data, data download): http://www.uba.de/57128
Detailed information: http://www.uba.de/11626
Last updated: 16.11.2023

Environmental importance

The maximum amount of pollutants that ecosystems can tolerate without being damaged is known as the 'critical load'. It is a measure of an ecosystem's sensitivity to pollution. Air pollution levels above these critical loads can permanently damage ecosystem structures and functions.

Excess deposition of airborne nitrogen compounds in terrestrial ecosystems can cause nutrient imbalances which may modify the species composition. Organisms that prefer low-nitrogen conditions will be displaced in favour of species that thrive in nitrogen-rich habitats.

Almost half of ferns and flowering plants on Germany's Red List are threatened by nutrient deposition. Moreover, many plants become more susceptible to frost, drought and pests due to changes in nutrient availability. The indicator focuses on natural ecosystems, especially forests, inland marshes, peat bogs, heathlands and nutrient-poor grasslands.

Assessing the development

Despite declining nitrogen deposition, in 2019 critical loads were still exceeded in 69 % of the area comprising vulnerable ecosystems. In 2005, this figure was as high as 79 %. High ammonia emissions associated with livestock farming and fertilisation are particularly problematic. These have fallen only marginally and are not expected to decline steeply in the near term.

The Federal Government has set a new target in the revised German Sustainable Development Strategy: The proportion of land affected by excess nitrogen deposition should fall by 35 % between 2005 and 2030 (BReg 2016). With the current calculation basis, this results in a target value of 52 % in 2030. To reach this target, the reduction commitments for ammonia and nitrogen oxides specified in the EU Directive 2016/2284 on the reduction of national emissions of certain atmospheric pollutants" have to be met. These commitments provide for a reduction by 29 % (NH_3) and 65 % (NO_x) compared to the reference year 2005. The measures that are suitable to reduce these emissions are portrayed in the national air pollution control program, according to the directive.

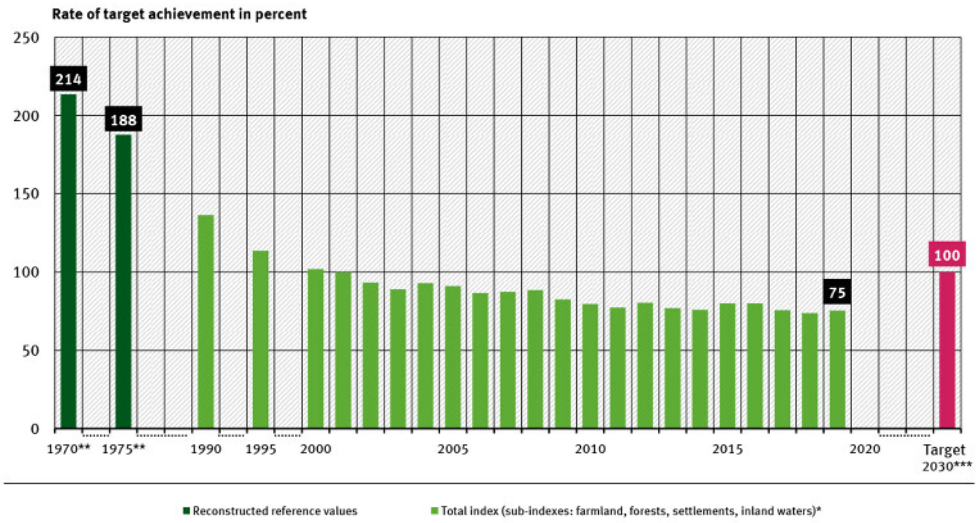
The German Environment Agency proposes measures aimed at solving the problem of nitrogen eutrophication in its publication 'Reactive nitrogen in Germany' (UBA 2015).

Methodology

The first stage is to calculate critical loads for vulnerable ecosystem types: How much nitrogen can be deposited without damaging the ecosystem in the long term? The critical loads are compared with substance depositions in the ecosystems which are calculated in the framework of national deposition modelling. Further information can be found in the reports of the European Environment Agency and the Federal Environment Agency (EEA 2014, UBA 2014 in German only). As part of the reporting on the National Biodiversity Strategy, a related indicator is published (BMUB 2015, in German only. Due to different methods, this indicator comes to different values.

Species diversity and landscape quality

Population of representative bird species in different landscape and habitat types*



* The total index comprises only the sub-indices agricultural land, forests, settlements and inland waters. The sub-indicator coasts and seas stands on its own. The sub-index for the Alps has currently been abandoned across the entire data series.
** The values for 1970 and 1975 are based on a reconstruction
*** Target of the German Sustainable Development Strategy

Quelle: UBA 2023, own representation from Indikatorenbericht der Bundesregierung zur Nationalen Strategie zur biologischen Vielfalt 2023

At a glance

- In 2019 the indicator was at 75.3 percent and remains far from the target value of 100 percent.
- Particularly the values of the sub-indicators for agricultural land and inland waters have shown a negative development in recent years.
- In the German Sustainable Development Strategy, the Federal Government envisages that the indicator should rise to 100 percent by 2030. Considerable additional effort is required to achieve this.

Indicator online (latest data, data download): http://www.uba.de/57129
Last updated: 13.10.2023

Environmental importance

A rich diversity of plant and animal species is essential to the balance of nature and provides an important natural resource for humans. Species diversity is closely linked to the diversity of habitats and landscapes. Sustainable forms of land use across the landscape and a responsible treatment of the natural environment are required to maintain biodiversity.

The indicator presented here was developed to assess the state of nature and landscape in Germany. It shows changes in the population of selected bird species which are representative of Germany's most important landscape and habitat types. Highly structured landscapes with intact, sustainably used habitats do not only provide habitats for birds. The indicator thus indirectly reflects trends in many other species living in the landscape and in the sustainability of land-use.

Assessing the development

In 1990, the indicator value was already significantly below the values that had been reconstructed for 1970 and 1975. The indicator continued to show a significant decline during the last 10 years of the data series. It was as low as 75 % of the target value in 2019. The main causes for this development are intensive agricultural use, landscape fragmentation and urban sprawl, sealing of soils and large-scale input of substances (e.g. nutrients, pesticides or acidifiers). The report 'Vögel in Deutschland 2014' (Wahl et al. 2015, *in German only)* illustrates this trend in detail. Especially the sub-indicators agricultural land and inland waters are well off target.

In 2004, the indicator was developed as a key indicator for sustainable land use as part of the Strategy for Sustainable Development and incorporated in the National Strategy on Biological Diversity (BMU 2007). Initially, the target value of 100 percent was to be achieved by 2015. According to a progress report on Germany's Sustainable Development Strategy, this deadline has been extended to 2030 by the government (BReg 2016). The 'Naturschutz-Offensive 2020' *(in German only)* sets out key measures to achieve a positive trend. Considerable additional efforts by federal, state, and local governments are needed to achieve the 2030 target in order to begin reversing the trend to meet the goal.

Methodology

The indicator shows the development of the populations of selected bird species for the most important landscape and habitat types in Germany. The indicator, which was developed in 2004, was reviewed and adapted in a research project from 2019 - 2022. For each bird species, a panel of experts defined a population target value for the year 2030 that can be achieved if nature conservation regulations and guidelines for sustainable development are implemented swiftly. The target values were standardized to give a target value of 100 percent for the overall indicator. A detailed description of the method can be found in Achtziger et al. 2004. The revision of the indicator will be presented in Dröschmeister et al. (in preparation).

02
Air

Emission of air polluants

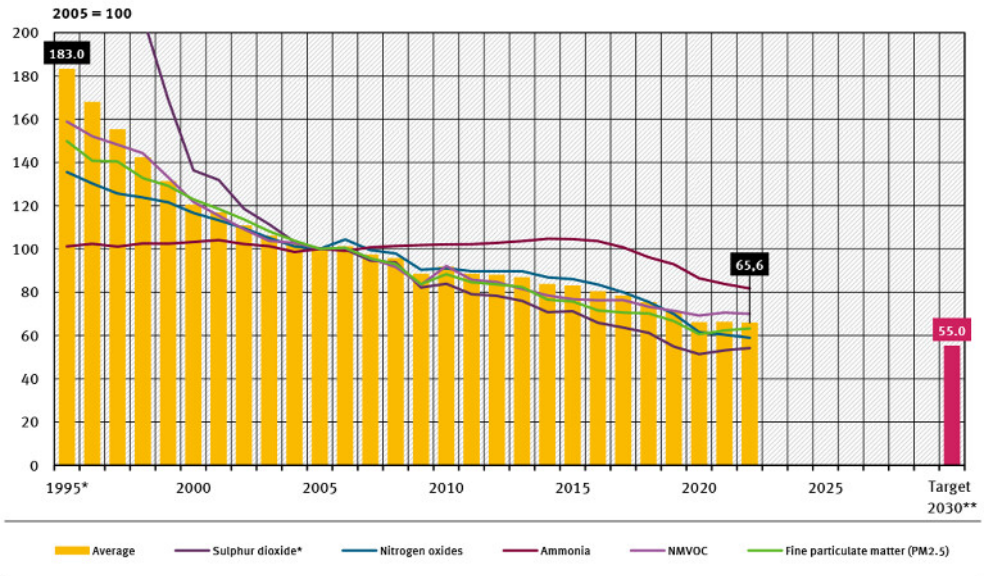
Air quality in agglomerations

Population exposure to particulate matter pollution

Emission of air pollutants

Index of air pollutant emissions

Mean percentage trend of different air pollutant emissions compared with 2005



* Sulphur dioxide value in 1995: 360
** 2030 target based on the future EU 'national emission ceilings directive' and the target of the Federal Governments 'Strategy for Sustainale Development'

Source: German Environment Agency, National trend tables for German reporting on atmospheric emissions since 1990, Emissions from 1990 to 2022 (version as of 03/2024)

At a glance

- The averaged index of air pollutants fell by 34.4% between 2005 and 2022.
- The obligations of the Gothenburg Protocol and the NEC Directive for 2020 were achieved.
- Safely meeting the commitments of the European NEC) Directive for 2030, is a challenge for the German environmental policy.
- Ammonia emissions must continue to be significantly reduced to achieve this.

Indicator online (latest data, data download): http://www.uba.de/57122
Last updated: 27.03.2024

Environmental importance

The indicator is based on the trend of five different pollutants (index) from different sources. Ammonia (NH_3) mainly comes from agriculture through livestock farming and fertilisation. Nitrogen oxides (NO_x) and sulphur dioxide (SO_2) are mainly produced by combustion processes in power stations and engines. Non-methane volatile organic compounds (NMVOCs) mainly arise from the use of solvents in industrial processes. Fine particulate matter with a particle size of less than 2.5 micrometres (PM2.5) is derived from combustion processes in households, road transport and agriculture.

Their impacts on the environment vary. Sulphur dioxide contributes to the acidification of ecosystems by causing 'acid rain'. Ammonia and nitrogen oxides lead to excessive nutrient enrichment (eutrophication). NMVOCs increase the amount of harmful ozone pollution. Among other things, PM2.5 causes respiratory diseases in humans.

Assessing the development

The value of the index has fallen over 60 % since 1995. However, the progress made with the different pollutants vary significantly. Emissions of sulphur dioxide have declined by almost 85 % since 1995. Emissions of ammonia, have declined only by 17 % since then.

Germany has committed to reducing emissions of the five main air pollutants in accordance with the 2012 amendment to the Gothenburg Protocol of the Geneva Convention on Long-Range Transboundary Air. Germany must reduce emissions by an average of 21 % by 2020 compared to 2005. This target was achieved. For the five air pollutants, further reduction obligations have also been set in the new European NEC Directive of December 2016. Accordingly, Germany must reduce emissions of the five air pollutants by an average of 45 % between 2005 and 2030. The Federal Government has included this reduction target in the German Sustainable Development Strategy.

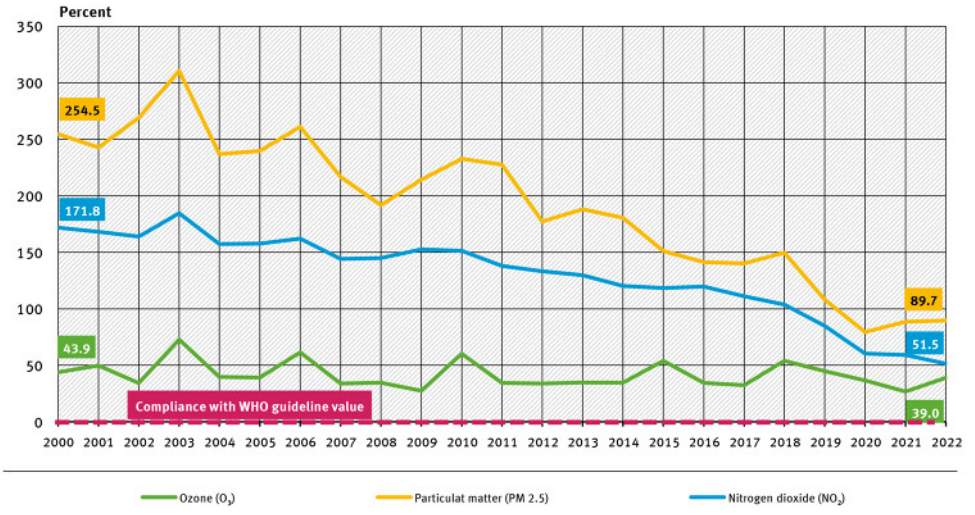
Achieving these targets is a major challenge for German environmental policy. Additional measures are needed, especially to reduce ammonia emissions from agriculture. Significant progress must also be made in the areas of e-mobility and the expansion of public transport, in building modernization, and in particulate matter emissions from small combustion plants (stoves and fireplaces) in order to ensure that the 2030 target values are safely achieved.

Methodology

The indicator is based on the relative trend of the emissions of five pollutants since 2005. Emissions of that year were set at 100 (indexed). The indicator is calculated from the annual average for the five pollutants. The calculation is based on data from the respective air pollutant inventories calculated by the German Environment Agency. These calculations are described in detail in the UBA's annual 'German Informative Inventory Report'.

Air quality in agglomerations

Discrepancy between average pollutant concentrations and WHO recommendations 2021* in urban background locations in German agglomerations



* WHO guideline values 2021: O_3: 100 µg/m³ as 99th percentile of max. daily 8-hour means; PM2.5: 5 µg/m³ in annual mean, NO2: 10 µg/m³ in annual mean

Source: German Environment Agency 2023

At a glance

- After the background level in German agglomerations exceeded the old recommendations of the World Health Organisation (WHO) only for the air pollutant ozone (figure left), the background level now clearly exceeds the updated WHO recommendations from 2021 also for particulate matter (PM2.5) and nitrogen dioxide NO2 (figure right).
- Close to sources, pollutant levels can even be significantly higher.
- The situation regarding NO2 and PM2.5 has greatly improved since 2000, but the current WHO recommendations of 2021 are still clearly exceeded.
- Ozone and PM2.5 pollution are very dependent on the weather. Levels thus fluctuate significantly.

Indicator online (latest data, data download): http://www.uba.de/57123
Last updated: 26.07.2023

Environmental importance

Nitrogen dioxide (NO_2), particulate matter (PM2.5) and ozone (O_3) are of particular concern to human health. All three pollutants affect the respiratory organs. Many premature deaths are also attributed to particulates, as well as damages to ecosystems.

Up to now, the indicator for ozone and particulate matter was based on air quality guideline values of the World Health Organisation WHO from 2005 (WHO 2006) and for NO_2 on recommendations of a WHO research report (WHO 2013). In 2021, the WHO published new, mostly significantly lower recommendations for air quality assessment based on the latest scientific findings on the health effects of air pollutants (WHO 2021). Due to the significantly stricter assessment thresholds for PM2.5 and NO_2, the distances of the average pollutant concentrations from the target increase, in some cases considerably. For ozone, the new WHO recommendation is somewhat less stringent than the old one, so that the distances to the target have even decreased somewhat.

Air quality is particularly precarious in agglomerations, where one third of the German population lives. Here, industry, traffic and residential areas exist in close proximity. The indicator incorporates data from monitoring stations which measure background urban pollution levels. At busy locations in cities pollution levels may be significantly higher. The indicator represents the average discrepancy of all monitoring stations of urban background from WHO guideline values, respectively.

Assessing the development

Levels of nitrogen dioxide and particulate matter have fallen considerably. 2019 is the first year in which nitrogen dioxide falls below the WHO recommendation in agglomerations. In 2020, the mean level of PM2.5 was also just below the WHO recommendation for the first time. However, ozone concentrations fluctuate widely. This is largely due to the influence of the weather. In hot summers such as 2003 or 2015, ozone concentrations rise sharply. Thus it is impossible to make a meaningful statement about the trend in recent years.

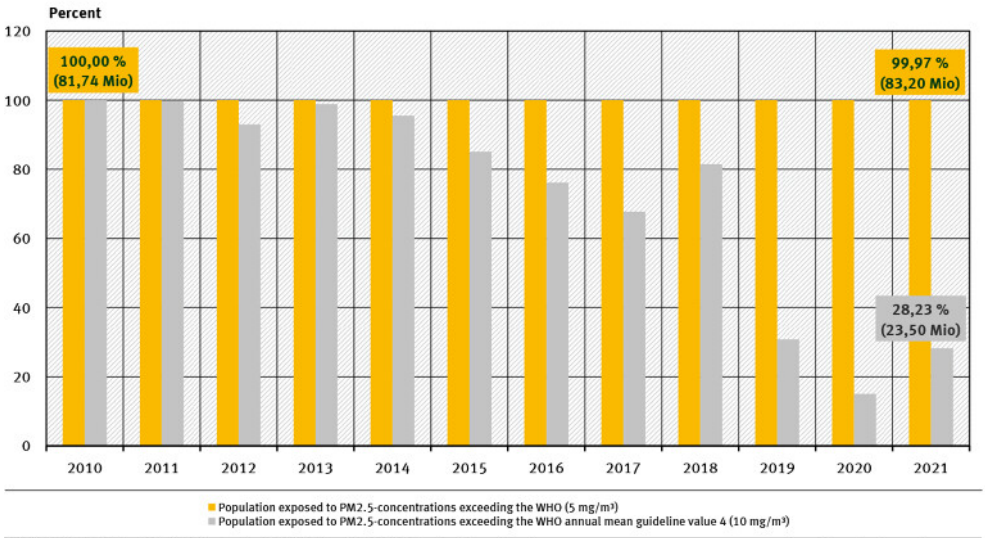
In 2008 the EU set out its air quality objectives in the Air Quality Directive (EU Directive – 2008/50/EC), in October 2022, the Commission presented a proposal to revise this directive (COM 2022) to take into account the new WHO recommendations 2021. Even then, large parts of Germany would still fail to meet some of the current less ambitious targets of the EU directive (UBA 2023). There is still a long way to go until the air in agglomerations is sufficiently ‘clean’.

Methodology

The indicator is based on measurement data from the network of German air quality monitoring stations. All monitoring sites within an agglomeration were included in the measurement of urban and suburban background pollution levels. Measurements of these monitoring sites are used to calculate the extent to which the three pollutants NO2, PM2.5 and O_3 exceed or fall short of WHO recommendations 2021. The average discrepancy between the values recorded at all monitoring stations and the WHO recommendation 2021 is calculated for each agglomeration. The average discrepancies are then averaged across all agglomerations and expressed in a standardised form with the WHO recommendation 2021.

Population exposure to particulate matter (PM2.5)

Population exposed to PM2.5-concentrations exceeding the WHO annual mean guideline value*



* WHO Air Quality Guidelines 2021: Guideline value 5 µg/m³; Interim Target 4: 10 µg/m³; The calculations are based on present population density results (population census 2011), scaled for each year.

Source: German Environment Agency 2024

At a glance

- Since 2010, the population's PM2.5 exposure above an annual average of 10 µg/m³ (interim target 4 of the new guideline values of the World Health Organisation (WHO) from 2021, equal to the old WHO guideline value from 2005) has decreased significantly in Germany.
- However, between 2010 and 2021, almost the entire population was exposed to particulate matter levels above the current WHO guideline value.
- Further measures to reduce particulate matter exposure in Germany are therefore required at national and European level to improve health protection.

Indicator online (latest data, data download): http://www.uba.de/57183
Last updated: 27.02.2024

Environmental importance

Particulate matter in ambient air is harmful to human health. The particles enter the human body through the respiratory system. Depending on the size of the particles, they can penetrate deeply into the respiratory system. Particularly small particles can enter the blood stream when penetrating the pulmonary tissue. There is clear evidence that particulate matter can trigger various diseases (see 'Particulate matter'). Particulate matter is mainly the result of human activities (e.g. combustion processes), but is also released by mechanical processes (e.g. the abrasion of tires and brakes). Part of the particulate matter is produced in the atmosphere by chemical reactions of other pollutants (such as nitrogen oxides and ammonia) and is therefore referred to as "secondary" particulate matter.

The indicator focuses on the particulate matter exposure levels from rural and urban background areas, but does not consider areas with increased particulate matter concentrations such as roads with high traffic volumes or areas that are close to large industrial plants. It can therefore be assumed that the approach used here slightly underestimates the overall exposure levels of the German population.

Assessing the development

During the entire period under consideration, almost the entire population of Germany was exposed to particulate matter concentrations above the current WHO guideline value for the PM2.5 fraction. This is 5 µg/m³ as an annual mean. The number of people affected in Germany increased slightly from 81.7 million to 83.2 million in the comparison between 2010 and 2021. However, this is due to the increase in the total population over this period. At the same time, the proportion of the population with PM2.5 exposure above the WHO interim target 4 (10 µg/m³ annual average) fell from 81.7 million in 2010 to 23.5 million in 2021 (corresponding to approx. 28.2 % of the population). This proves that measures to reduce emissions in recent years have already led to a significant reduction in particulate matter pollution in Germany.

A further reduction in exposure is expected by 2030 as a result of the emission reduction obligations under the NEC Directive. If the measures from the national air pollution control programmes are implemented (in Germany, these include the "coal phase-out", the reduction of ammonia emissions from agriculture and the transformation of transport (e-mobility)), emissions of fine particulate matter and its precursor gases can be further reduced by 2030. To protect health, however, even more far-reaching measures are also required at European level to further reduce particulate matter pollution. The EU Air Quality Directive (EU Directive 2008/50/EC) is currently being revised with the aim of aligning it more closely with the WHO recommendations in future. The proposal for a new EU limit value for PM2.5 from 2030 of 10 µg/m³ as an annual average is currently being discussed, which would correspond to the WHO's interim target 4.

Methodology

For the indicator, model data of the chemical transport model REM-CALGRID are combined with PM2.5 measurement data of the immission measurement networks of the federal states and the UBA and transferred to the entire area of Germany. Only those measuring stations that are not directly exposed to particulate matter emissions, for example from traffic, are considered for the indicator. The PM2.5 data is then combined with spatial information on population distribution. The methodological approach is described in Kienzler et al. 2024 (UMID 1/2024; in press).

03
Water

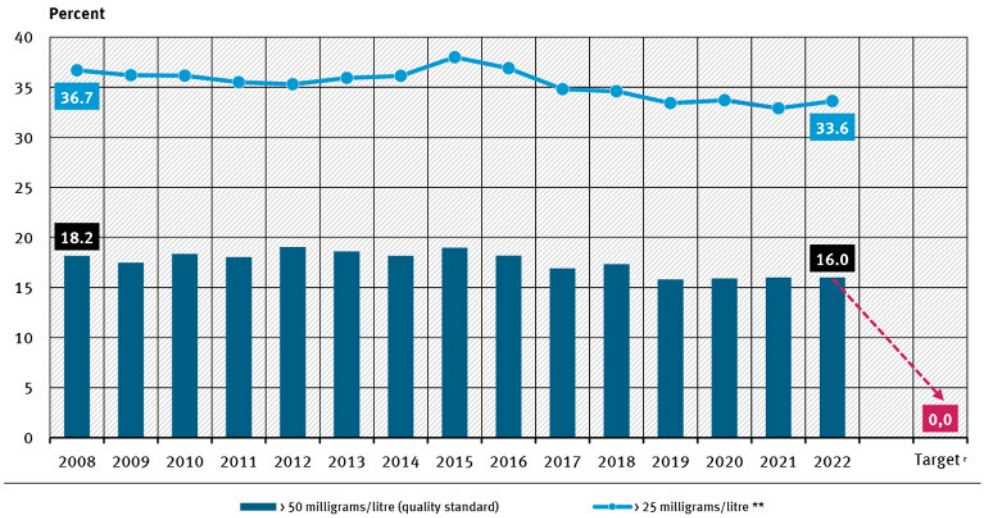
Nitrate in groundwater

Plastic waste in the North Sea

Ecological status of rivers

Nitrate in groundwater

Share of monitoring sites exceeding the quality standard for nitrate in groundwater*



* Basis: EEA monitoring network; quality standard: 50 milligrams per litre annual mean value
** The value serves as an early warning threshold and includes the share of sampling sites exceeding 50 mg/l.
*** Target set by the Nitrates Directive and the German Sustainable Development Strategy

Source: German Environment Agency and the Länder Initiative on Core Indicators (LIKI) 2023 based on data from the German Working Group on water issues of the Federal States and the Federal Government

At a glance

- The European Nitrates Directive, the Groundwater Directive and the German Groundwater and Drinking Water Ordinances require that exceedances of the limit value for nitrate of 50 milligrams per liter be prevented.
- Since 2008, the quality standard has been exceeded every year at almost one in six measuring points.
- Extensive changes to the fertilizer legislation have allowed the designation of particularly polluted areas since 2023, combined with stricter management requirements and the introduction of a national monitoring program.
- The agricultural input of nutrients is the main cause of high nitrate concentrations in groundwater.

Indicator online (latest data, data download): http://www.uba.de/57158
Last updated: 16.01.2024

Environmental importance

In agriculture crops are given the necessary nitrogen via fertiliser. However, the fertiliser is often not applied correctly for the specific site and use. Excessive nitrogen is leached out and ends up as nitrate in the groundwater and other water bodies. This leads to eutrophication in rivers and lakes (cf. 'Ecological status of rivers' and 'Ecological status of lakes' indicators), and to nitrogen enrichment and exceedance of the nitrogen threshold in groundwater. Nitrate can be converted to nitrosamines in the human body. This can result in disruption to the oxygen transport in infants (methemoglobinemia). The nitrogen threshold is very rarely exceeded in drinking water. It is complex and expensive to remove nitrate from pipe water in water treatment plants.

Assessing the development

The aim of the European Nitrates Directive (EU Directive 91/676/EWG) is to prevent pollution of groundwater by agricultural nitrate inputs. Governments are obliged to develop action plans to prevent nitrate concentrations above 50 mg/l. Since 2016, compliance with the nitrate quality standard has also been a goal of the German Sustainable Development Strategy. Since 2008, the share of monitoring sites which exceed the quality standard lies between 16 and 19 %. The share of monitoring sites with a nitrate concentration above 25 mg/l has also stagnated since 2008 at around 33–38 %.

The central legal instrument for implementing the Nitrates Directive is the German Fertiliser Application Ordinance. It defines "good professional practice in fertilisation" and specifies how the risks associated with fertilisation are to be minimised. It is an essential component of the national action plan. In February 2020, the federal government presented a new draft that had been agreed with the EU and which was approved by the Bundesrat on 27 March 2020: It has been legally effective since 1 May 2020.

On 21 June 2018, the European Court of Justice had found Germany guilty of violating the EU Nitrates Directive (Rs. C-543/16) because the directive had not been implemented adequately and the measures taken so far were not sufficient to achieve a significant reduction in nitrate pollution. As a result, Germany has repeatedly revised its fertilizer legislation, in particular the Fertilizer Ordinance (DüV). It now allows polluted areas to be designated separately and stricter management requirements to be enforced there. In addition, Germany has been setting up a national monitoring program since 2019, which is intended to enable annual statements to be made on nutrient pollution and the effect of the measures under the DüV. A new monitoring regulation is to form the legal basis for this impact monitoring in the future. The EU infringement proceedings against Germany were discontinued on June 1, 2023. The extent to which the additional measures now implemented are sufficient to reduce nitrate pollution of groundwater will be shown by measurements in the coming years.

Methodology

Germany has to send data on the condition of the groundwater to the European Environment Agency (EEA) on a regular basis. The Federal States therefore selected representative monitoring sites to add to the EEA groundwater network. These are reported to the EEA through the German Environment Agency. The indicator compares the monitoring sites where the quality standard is exceeded with the total number of monitoring sites.

Plastic waste in the North Sea

Percentage of beached fulmars on the North Sea coasts of Germany with over 0.1 g of plastic in their stomachs (5 year average)

Source Data until 2019: Research and Technology Centre West Coast (2019), OSPAR Fulmar Litter EcoQO - Mass of plastic waste parts in the stomachs of fulmars.
Source data 2020-2021: Enners, L; Kühn, S. & Guse, N. 2022. Fulmar Litter Threshold Value Monitoring in Germany - 2020 & 2021. Vorhaben: Monitoring von Müll in Mägen von Eissturmvögeln. Update 2020 & 2021.

At a glance

- Since studies began, the stomachs of 88 % to 97 % beached fulmars have been found to contain plastics.
- Around 49 % of beached fulmars on the North Sea coasts have more than 0.1 grammes of plastic in their stomachs.
- The target set by the OSPAR convention is to reduce this to a maximum of 10 %. However, it may take a long time to reach this target.
- Large quantities of plastic waste still end up in the oceans, where plastic degrades very slowly.

Indicator online (latest data, data download): http://www.uba.de/57157
Last updated: 06.06.2023

Environmental importance

While 9-14 million tons of plastic waste ended up in the oceans in 2016, entries are expected to triple to 23-27 million tons by 2040. Garbage particles are mistaken for food by animals and, once consumed, can injure and clog their digestive organs, which can lead to the death of the animals. Around 820 species of marine life have been scientifically documented to be affected by negative interactions with marine litter. The most obvious effects are ingestion of and entanglement in marine litter. The entanglement of marine life in litter items causes visible injuries which can be fatal, the effects of swallowing litter are often invisible.

For monitoring purposes, the fulmar has been established as an indicator species in the North Sea. This seabird has a wide distribution and feeds exclusively at the open sea. There, he confuses floating plastic parts with food particles and accumulates them in his stomach for several weeks. So far no species has been identified for the Baltic Sea which can be used for similar studies. Therefore no comparable information for the Baltic Sea is available for the time being.

Assessing the development

The majority of the fulmars found dead on the beaches of the German North Sea coast have plastic waste in their stomachs. The average quantity of plastic swallowed in recent years has declined slightly, as well as the share of animals with more than 0.1 g of plastic in their stomach. In the current 5-year period (2017-2021), 88 % of the 103 fulmars studied in Germany had plastic in their stomachs, with 49% of fulmars exceeding the critical level of 0.1 grams.

Germany has signed the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR). In 2008 the Contracting Parties to OSPAR decided as one of its so-called Ecological Quality Objective (EcoQO) that the percentage of beached fulmars having more than 0.1 g of plastic in their stomachs should be 10 % at the maximum. This value was derived from fulmars in the relatively unpolluted Canadian Arctic.

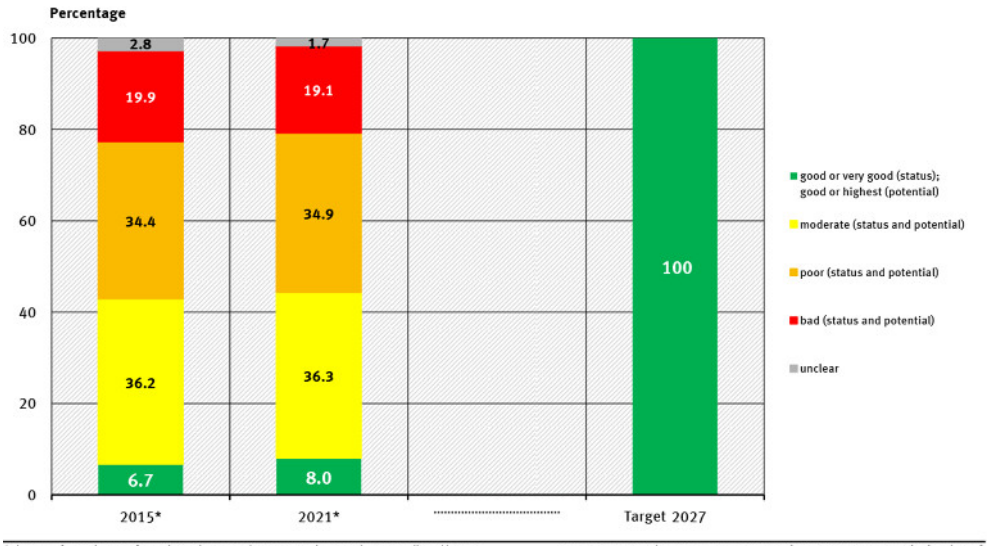
Large quantities of plastic waste are still entering the seas and plastics take a very long time to break down. Therefore it can be expected, that the OSPAR target can only be achieved in the long term. An important instrument for reducing further inputs and existing quantities of marine litter in the Northeast Atlantic is the 2. OSPAR Regional Action Plan on Marine Litter adopted in 2022 (OSPAR Commission 2022). It addresses a series of measures related to the relevant sea- and land-based sources and on opportunities for the removal of marine litter and awareness raising.

Methodology

The indicator is based on studies of beached (dead) fulmars on the North Sea coasts of Germany (south-east North Sea). In the laboratory, various parameters are then determined regarding the state of health and the possible cause of death. The stomach contents are then examined. Then the percentage of fulmars that have more than 0.1 grammes of plastic in their stomach is calculated. As the values sometimes greatly deal between years, the indicator is calculated as the average of the last five years (Guse et al. 2012, in German only). In the other countries bordering the North Sea, the plastic contamination of fulmars is also determined using the same standardised method in order to be able to compare the development between the regions.

Ecological status of rivers

Percentage of running waters in at least good status or with at least good potential



* The year refers to the year of reporting to the EU. For the 2015 reporting year, data were collected between 2009 and 2014. The reporting year 2021 uses data collected between 2015 and 2020.

Source: German Environment Agency, report portal WasserBLicK; German Federal Institute of Hydrology 2021, management plans for the period 2022 to 2027

At a glance

- In 2021 only around 8 % of German streams and rivers were in at least a good ecological status or had at least a good ecological potential.
- According to the European Water Framework Directive, by 2015 with a time extension to 2027 all rivers must have achieved at least a good ecological status or potential.
- The time up to 2027 must be used to reach these demanding targets.
- The measures taken to date require more time to take effect. Other measures are also required.

Indicator online (latest data, data download): http://www.uba.de/57159
Last updated: 13.10.2022

Environmental importance

Streams and rivers are an important part of the environment. The landscapes away from the coastsare mainly shaped by rivers. Their status has deteriorated seriously in the past. Due to water engineering works over the last few centuries, around half of all streams and rivers are now considerably modified or artificial. Rivers are also polluted by contaminants and nutrients from industry, private households and agriculture.

Water pollution causes changes in the original species composition. The indicator primarily reflects the degree to which the current species composition in the rivers corresponds to the original composition. The closer the species diversity to the original status, the better the ecological status and therefore the more resilient the ecosystem. The ecological potential, on the other hand, is specified in significantly modified or artificial water bodies, because a comparison with the natural species composition is not possible in such cases.

Assessing the development

In 2021, the share of rivers in at least good ecological status or with at least good ecological potential has increased slightly by about 1 % compared to 2015. This share was just almost 8 % when last measured. The most important reason for this is that species communities which have been disturbed on the long term require time to recover. This was initially underestimated. However, the share of running waters in a bad or poor status declined further between 2015 and 2021. At the same time the share of running waters in a moderate ecological status increased slightly.

The European Water Framework Directive (WFD, EU Directive 2000/60/EC) was agreed in 2000. This set a target for all water bodies in Europe of a good or very good status by 2027 at the latest. The Federal States drew up management plans defining measures for improving water quality. Germany was not the only country that missed the 2021 target for most streams and rivers by a large margin. The current and subsequent management cycles under the WFD must now be utilised in order to achieve the ambitious targets as soon as possible.

Methodology

The ecological status of a stream or a river is primarily defined on the basis of the presence of different species and their abundances. This is compared with the species composition which would naturally be present in this type of water body. Five status classes are defined, depending on the degree of divergence, from ‘very good’ to ‘bad’. An ecological potential is assessed for artificial and heavily modified water bodies. The highest potential is present when all measures to improve the environmental quality have been taken which do not have a significant negative effect on use. The classification is laid down in the Surface Waters Ordinance (cf. water protection policy in Germany).

04
Conservation of resources: raw materials and waste

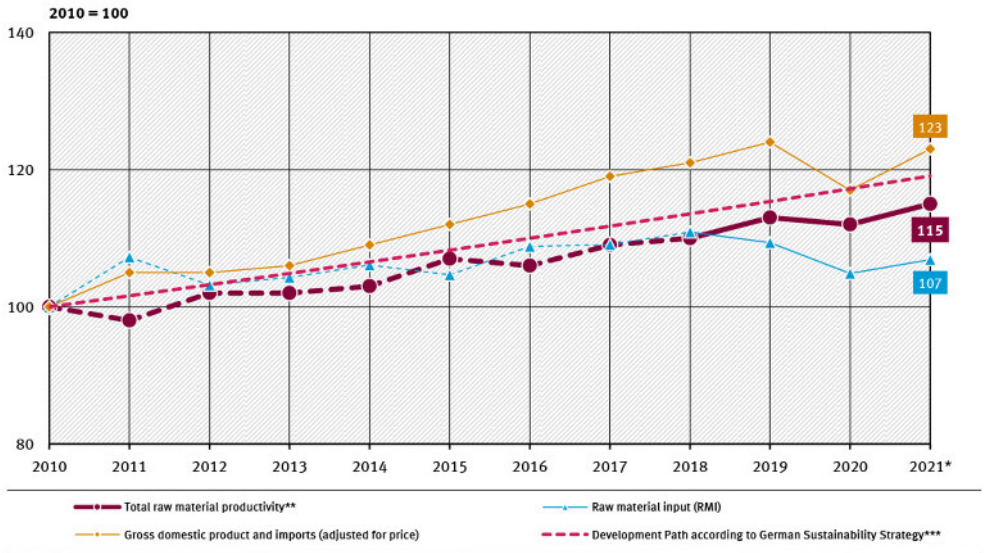
Total raw material productivity

Raw material footprint

Amount of waste – municipal waste

Total raw material productivity

Total raw material productivity
Sum of gross domestic product and imports in relation to primary raw material input (RMI)



* Preliminary result (as of 01/2024)
** Calculations by the Federal Statistical Office based on non-published differentiated data
*** Target according to "German Sustainability Strategy. Revision 2021": desired annual total raw material productivity growth rate from 2010 to 2030 corresponds to average annual growth between 2000 and 2010 (approx. 1.6 %)

Source: Federal Statistical Office 2024, 'Gesamtrohstoffproduktivität und ihre Komponenten, Index 2010=100', available online (accessed: 2024-01-08)

At a glance

- The total raw material productivity grew by 15 % between 2010 and 2021.
- According to the German government, an average growth of 1.6 % of total raw material productivity must be achieved between 2010 and 2030.
- With annual growth averaging around 1.3 %, the current development is below this target.
- Total raw material productivity is a measure of the efficiency of raw material use and also includes raw materials that were needed to produce imported goods.

Indicator online (latest data, data download): http://www.uba.de/57185
Last updated: 25.01.2024

Environmental importance

Primary raw materials are obtained mainly from mining but also in forestry and agriculture. Some of these economic activities have huge environmental impacts. An aim of environmental policy is therefore to ensure that the national economy uses raw materials as efficiently as possible. In order to measure this development, the indicator 'Total raw material productivity' relates economic activity to the utilisation of raw materials. However, Germany imports and exports mainly processed goods and finished products. The indicator 'Primary raw material inputs' reflects the extent to which primary raw materials are actually used. It is based on raw material equivalents. It therefore includes the total weight of primary raw materials which were required to produce the goods made in Germany or imported to Germany.

Assessing the development

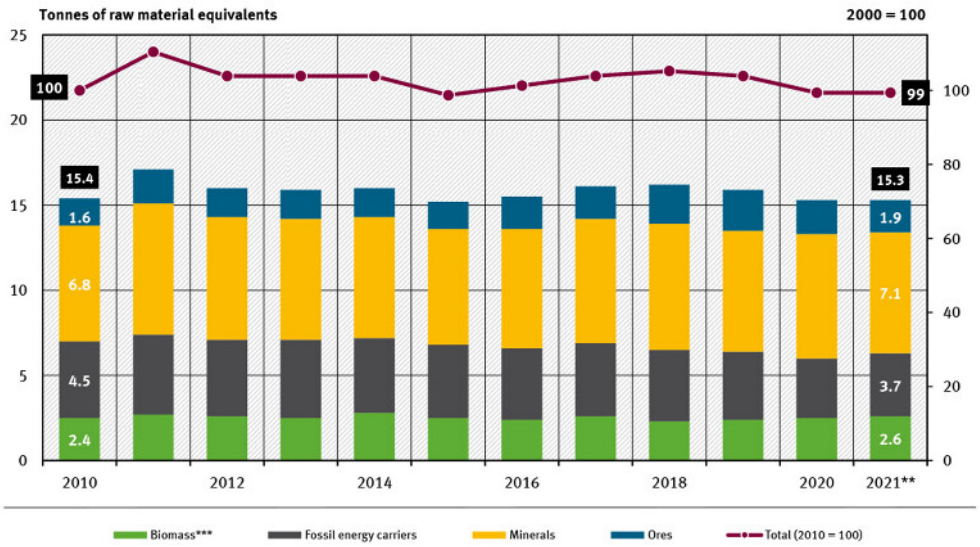
Total raw material productivity in Germany increased by 15% between 2000 and 2021. The main reason for this was the development of the gross domestic product (GDP) and import values. These increased almost continuously in the period under review. The use of primary raw materials showed a significantly lower increase in the same period and even fell slightly several times, most recently in the years from 2018 to 2020. It should be noted that 2020 was an exceptional year, as demand and the associated supply chains were affected worldwide due to the COVID-19 pandemic, among other things. In the new edition of the German Sustainability Strategy of 2016, the German Government has set a new goal for the further growth of raw material productivity: Between 2010 and 2030, the value is expected to increase by an average of roughly 1.6 % per year, which was the average annual increase between 2000 and 2010 (BReg 2016). However, growth from 2010 to 2021 was only about 1.3 % per year, a rate currently below the target path of the sustainability strategy. In the German Resource Efficiency Programme III (ProgRess III) records a large number of measures for the years from 2020 onwards to increase the productivity of raw materials (BMU 2020). As new topics, resource-efficient mobility and the potentials and risks of digitalization for resource efficiency are now being considered in ProgRess III. The German government is also currently developing a National Circular Economy Strategy (NKWS), which will bring together targets and measures for circular economy and resource conservation from all relevant strategies.

Methodology

The total raw material productivity results from the ratio of two variables: The numerator is formed from the sum of gross domestic product and the monetary value of German imports. This figure is prepared by the national accounts of the Federal Statistical Office of Germany. The denominator contains the information on the primary raw material input in Germany from production and imports in tonnes. Both variables are presented as an index (2010=100). The process for determining the indirect imports (‘raw material equivalents’) is described in a research report (UBA 2016, in German only). Due to methodological adjustments by the Federal Statistical Office, the time series from 2010 onwards differ from previously published figures. Noticeable changes occur in particular in the raw material group of ores. For more detailed explanations, please refer to the Statistischen Bericht "Rohstoffäquivalente - Berichtszeitraum 2000-2021" (Destatis 2023, in German only). To calculate the index values on which this indicator is based, the Federal Statistical Office uses more precise data than those published there.

Raw material footprint

Raw material use for domestic consumption and investments (RMC) per capita*



* RMC = Raw Material Consumption
Calculations by the Federal Statistical Office based on non-published differentiated data
** Preliminary results (as of 01/2024)

Source: Federal Statistical Office 2021, Statistischer Bericht Rohstoffäquivalente - Berichtszeitraum 2010 bis 2021 (in German only)

At a glance

- Primary raw material use per capita, or the raw material footprint, decreased only by 1 % between 2010 and 2021.
- These figures include raw materials which were required for the production of consumed goods at home and abroad.
- German raw material consumption is too high by international comparison and is to be reduced further.

Indicator online (latest data, data download): http://www.uba.de/57186
Last updated: 25.01.2024

Environmental importance

The production of goods and the provision of services requires raw materials. The German economy is strongly integrated internationally. Germany imports and exports large quantities of semi-finished and finished products. The weight of raw materials used for this manufacture is taken into account in the calculation of the raw material equivalents. These include all raw materials used in the production of these goods both at home and abroad. The indicator shown here includes the total weight of all goods used in Germany for home consumption – including the 'raw material equivalents'. In order to make the issue understandable and comparable, 'raw material footprint is referred to the number of inhabitants in Germany.

The mining or cultivation of these raw materials and their subsequent processing are accompanied by large environmental impacts. If the global per capita raw material consumption were as high as in Germany, this would put a heavy burden on global ecosystems. Germany is therefore responsible for reducing the use of primary raw materials.

Assessing the development

Per capita consumption of raw materials fluctuated slightly between 2010 and 2021. After an initial increase of 10 %, it remained slightly above the initial level. From 2018, per capita raw material consumption fell and is now at 99 % of the initial level. There was a noticeable reduction of 0.7 tonnes per capita between 2019 and 2020, which is partly due to the restrictions imposed as part of the Covid-19 pandemic measures. In particular, there was a noticeable decline in investment demand in the economy. In contrast, demand for raw materials for consumption by the state and private non-profit organisations increased by around 10% between 2019 and 2021. This trend can also be seen in the raw material groups: Falling demand for fossil fuels (e.g. in transport) and metal ores (e.g. in mechanical engineering and vehicle construction) was offset by a relatively constant demand for mineral raw materials (e.g. construction activities of the state). The recycling of waste is also relevant: This reduces the need for raw materials that need to be extracted from the environment and is counted towards raw material consumption.

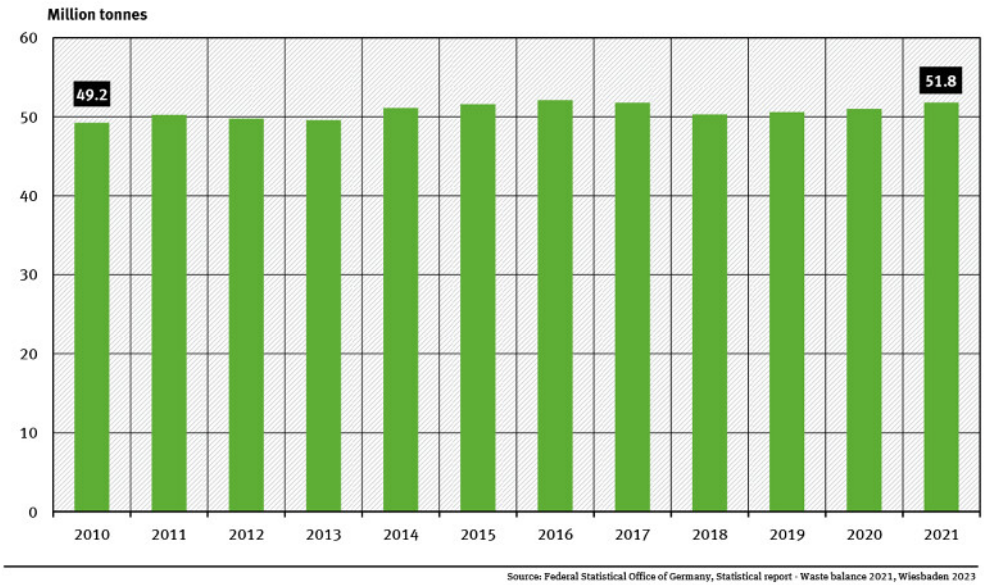
So far German and European policies have not set a quantitative target for raw material consumption. However, experts and the German Environment Agency believe that consumption of raw materials needs to be reduced considerably. Political strategies such as the German Resource Efficiency Programme III (BMU 2020, *in German only*) head in the right direction, but require further ambitious development in the long term as with the National Circular Economy Strategy.

Methodology

The indicator 'Raw material footprint' is composed of domestic raw material extraction and imports minus exports. The method was developed in research projects for the German Environment Agency and is described in a research report (UBA 2016, *in German only*). In addition to raw material use for domestic consumption and investment, Germany's raw material footprint also includes stock changes in raw material equivalents.Due to methodological adjustments by the Federal Statistical Office, the time series from 2010 onwards differ from previously published figures. More detailed explanations can be found in the statistical report Statistischen Bericht "Rohstoffäquivalente - Berichtszeitraum 2000-2021" (Destatis 2023, *in German only*). T o calculate the index values on which this indicator is based, the Federal Statistical Office uses more precise data than those published there.

Amount of waste – municipal waste

Waste generation in municipal waste category



Source: Federal Statistical Office of Germany, Statistical report - Waste balance 2021, Wiesbaden 2023

At a glance

- The volume of municipal waste fluctuates only slightly over time. In 2021 it stood at 51.8 million tonnes.
- The target of environmental policy is the avoidance of waste generation.
- This target has not been achieved for the municipal waste. To reduce resource consumption, municipal waste has to decline.

Indicator online (latest data, data download): http://www.uba.de/57187
Detailed information: http://www.uba.de/12535
Last updated: 11.10.2023

Environmental importance

Government is pursuing a variety of strategies to reduce the economy's demand for raw materials. One approach is the prevention of waste. Paragraph 6 of the German Circular Economy Act defines a waste hierarchy. It assigns the highest priority to the prevention of waste. Waste that is not generated does not cause any environmental impacts, which would otherwise be caused by its collection, sorting and further recycling or dumping.

Germany's total volume of waste is made up of municipal waste, waste from the extraction and treatment of natural resources, other waste (particularly from production and trade), construction and demolition waste and waste from waste treatment plants. Although the volume of waste is dominated by construction waste, which accounts for around 54% of the volume, and thus primarily reflects the economic situation in the construction industry, the relevance of the respective waste streams should also be taken into account.

The indicator used here represents the development of the municipal waste sub-stream, which accounted for around 12.6% of total net waste generation in 2021. Municipal waste essentially comprises the types of waste generated by municipal waste management companies. "Waste producers" are primarily private households, administration and commercial enterprises. The volume of municipal waste thus reflects the behavior of a broad spectrum of waste producers and is divided into non-hazardous and hazardous waste.

Assessing the development

The amount of municipal waste has changed little in the period between 2010 and 2021: While it was still at 49.2 million tonnes in 2010, the peak was reached in 2016 at 52.1 million tonnes. In the following years, the volume of municipal waste remained at levels above 50 million tonnes.

With the aim of strengthening waste avoidance, the federal government adopted a Waste Prevention Programme in 2013 with the participation of the states in accordance with Section 33 of the German Circular Economy Act (KrWG), which was updated in 2020. While the KrWG states that avoiding the generation of waste is the highest priority, the Waste Prevention Programme aims to decouple economic growth and waste volume: The amount of waste should grow at most as fast as the economy. While there was no decline in waste volumes in the period under review, a slight decoupling from economic growth can be observed: While the German economy grew by about 15.9 % between 2010 and 2021 (Federal Statistical Office 2023, GDP price-adjusted, *in German only*), the amount of municipal waste increased by only about 5.9 %. Further efforts are required to effectively reduce waste volumes at all stages of the value chain.

Methodology

The amount of waste was published annually in the waste balance sheet of the Federal Statistical Office until the 2020 reporting year. From the 2020 reporting year, the previous format of the waste balance sheet was replaced by the Statistical Report - Waste Balance Sheet (Federal Statistical Office 2023, in German only). The waste statistics are based on a number of different surveys, which are combined into the waste balance. Further details on the waste statistics surveys can be found in the respective quality reports (in German only). In 2002, there were major shifts between the categories due to the changeover to the European Waste Catalogue. For this reason, the indicator is only presented from 2002 onwards.

05
Climate

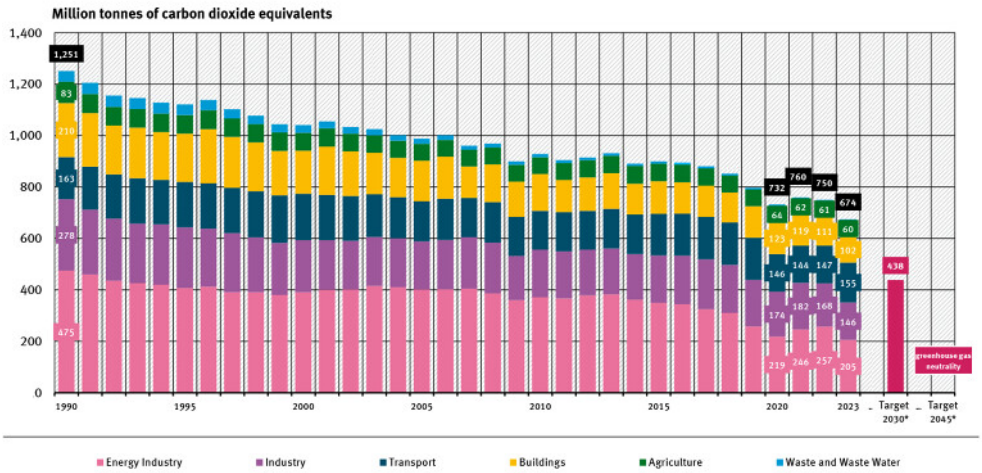
Greenhouse gas emissions

Global surface temperature

Hot days

Greenhouse gas emissions

Emission of greenhouse gases covered by the UN Framework Convention on Climate



Emissions by sector of the German Federal Climate Protection Act, excluding land use, land use change and forestry
* Targets 2030 and 2045: according to the revision of the Federal Climate Protection Act (KSG) as of 12.05.2021

Source: German Environment Agency, National Greenhouse Gas Inventory 1990 to 2022 (as of 01/2024, EU Submission) and Early Estimate for 2023 (UBA Press release No. 11/2024)

At a glance

- According to initial calculations, greenhouse gas emissions in Germany declined by exactly 46.1 % between 1990 and 2023.
- Germany aims to reduce greenhouse gas emissions by 40 % by 2020 and by at least 65 % by 2030 compared to 1990 emission levels. Complete greenhouse gas neutrality is to be achieved by 2045.
- In 2023, Germany was well below the target of minus 40 % set for 2020. The targets for 2030 appear to be achievable.
- With the ‘amended Federal Climate Protection Act’ in 2021, the allowed sectoral emission quantities for the year 2030 were significantly reduced and the greenhouse gas neutrality to be achieved was brought forward from the year 2050 to the year 2045. To achieve the climate protection targets for 2030, the German government is developing climate protection programs. These may be supplemented by immediate climate protection programs.

Indicator online (latest data, data download): http://www.uba.de/49509
Last updated: 27.03.2024

Environmental importance

Greenhouse gases are released mainly through the use of fossil fuels such as coal and petroleum. Industrial processes and livestock farming are also relevant emission sources. Rising levels of greenhouse gases warm the earth's atmosphere, leading to climate change. Global warming has diverse negative impacts such as rising sea levels, increased risks of flooding, drought and other extreme weather events.

Thus at the 2015 Climate Summit in Paris the international community agreed to limit the temperature increase to 1.5 °C when possible and to keep it **well below** 2 °C. This can only be achieved if global greenhouse gas emissions are rapidly reduced.

Assessing the development

Greenhouse gas emissions in Germany have fallen since 1990: from 1,251 million tonnes of CO_2 equivalents in 1990 to 674 million tonnes in 2023. Overall, this corresponds to a reduction of exactly 46 %. Excluding the low values in certain years with special circumstances, the indicator follows a long-term downward trend. After a period of stagnation, emissions have fallen significantly in 2018 to 2023, mainly due to the rising share of renewable energies, declines in fossil energy generation and, above all, lower demand for energy from industry and consumers in 2023. In 2023, emissions fell by 76 million tonnes of carbon dioxide equivalents or 10.1 % compared to the previous year (cf. UBA press release 11/2024).

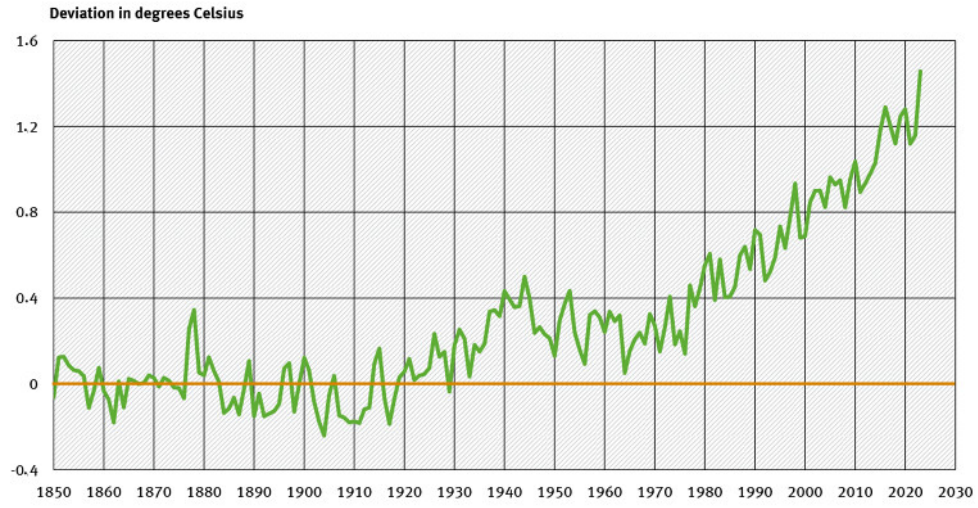
At the end of 2015, a successor agreement to the Kyoto Protocol was agreed with the Paris Convention. The development to date makes it clear that intensive efforts in climate protection are necessary to achieve the targets. The German government has therefore initiated measures in the form of the Climate Action Programme 2020, the Climate Action Programme 2030 and the Climate Action Programme 2023 (*in German only*). With the Federal Climate Change Act, binding annual emission quantities for 2019 as well as a monitoring and sharpening mechanism for the individual sectors were agreed upon in order to ensure the greenhouse gas reduction target of 'at least 65 %' by 2030 and greenhouse gas neutrality in 2045.

Methodology

The indicator is based on the National Greenhouse Gas Inventory 1990-2022 (EU Submission, January 2024) and separately calculated emissions data for 2023 (cf. UBA press release 11/2024). The calculation method is described in the latest inventory report (UBA 2023). Emissions of all greenhouse gases governed by the Kyoto Protocol (e.g. carbon dioxide, methane) are compiled in a standardised format. Since the different gases have different impacts on the climate, their effect is expressed in terms of the effect of carbon dioxide (CO_2 equivalents).

Global surface temperature

Deviation from global mean surface temperature 1850 to 1900*



* The zero line corresponds to the global average surface temperature from 1850 to 1900.

Source: Met Office Hadley Centre, Climate Research Unit; HadCRUT.5.0.2.0 model; median of 200 calculated time series /retrieved 02/2024)

At a glance

- 2023 was the warmest year worldwide since records began 1850.
- The last nine years have been the warmest years worldwide since 1850.
- The Paris Agreement stipulates that the increase in global temperature should be limited to well below 2 °C above pre-industrial levels, and even to 1.5 °C. Due to historical data availability, the comparative period used by WMO for this purpose is 1850 to 1900.

Indicator online (latest data, data download): http://www.uba.de/57080
Last updated: 15.02.2024

Environmental importance

Climate change manifests itself as an increase in the global average surface temperature. But we are also seeing ocean temperature and acidity on the rise, increases in weather variability and damages and frequency of extreme weather events such as heavy precipitation, heat waves and droughts. Germany as well has growing warmer and hotter over the years, and more so than the global average. As a result, the number of hot days increases (cf. 'Hot days' indicator). The increase in average temperatures is also changing the duration of individual seasons. As of yet we have only a partial understanding of the complex effects of these seasonal shifts on plants and animals.

The global annual mean temperature alone is of little climatological significance. We obtain more information from a given year's global mean deviation from the average for a longer period in the past. This shows whether one year was warmer or cooler than the climatological average. Usually a comparison is made with the period 1850 to 1900, which is also used by the WMO.

The 'German Strategy for Adaptation to Climate Change' envisages climate impact monitoring (BReg 2008). Climate change impacts and adaptation in different areas are published in a monitoring report which is updated every four years.

Assessing the development

To prevent dangerous interference to the climate system, the aim is to limit the temperature increase to well below 2 degrees Celsius (°C) above pre-industrial levels, and even to 1.5 °C. This is the Paris Agreement adopted by the global community at the 2015 Climate Conference in Paris (UNFCCC 2015). To meet this target, global greenhouse gas emissions must be reduced rapidly and substantially (cf. 'Greenhouse gas emissions' indicator), to achieve global greenhouse gas neutrality by 2050 at the latest.

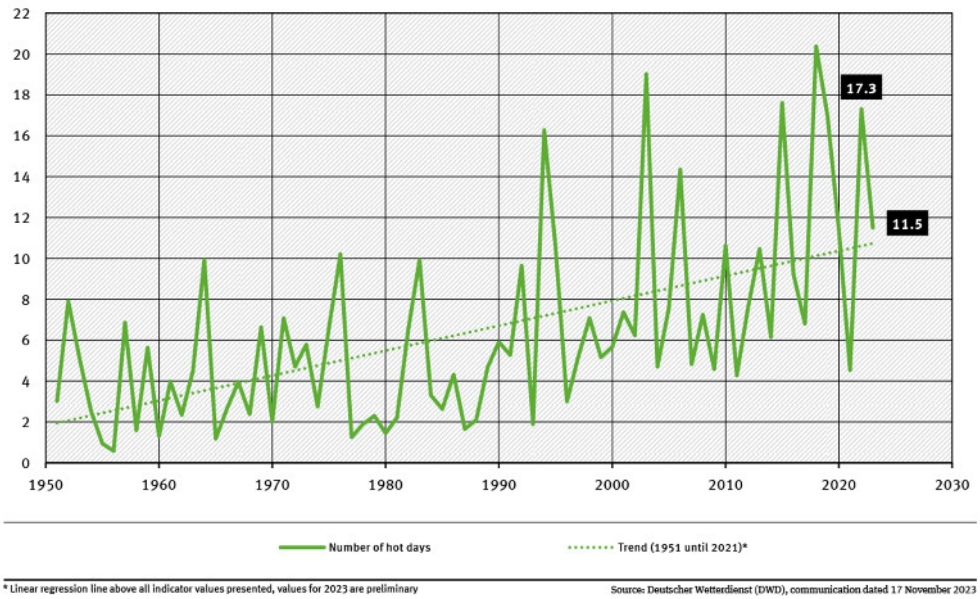
In 2023, the global mean of ground-level air temperature was about 1.5 °C above the mean from pre-industrial times, according to WMO calculations. This made 2023 the warmest and hottest year ever recorded, with a very small gap to the previously warmest year. The last nine years were the warmest years worldwide since 1850.

Methodology

The Hadley Centre's temperature data form part of an internationally recognised body of temperature datasets. As with other available datasets, the global average surface temperature is based on measurement data from meteorological stations. The global average surface temperature is calculated from worldwide measurements using a combination of calculation rules and interpolations with the HadCRUT5 model (Morice et al. 2021). In addition to the HadCRUT5 data shown here, the WMO also uses time series from other institutes, including ECMWF, NASA, NOAA, and JMA.

Hot days

Number of days when maximum air temperature exceeds 30 degrees Celsius (areal mean)



* Linear regression line above all indicator values presented, values for 2023 are preliminary

Source: Deutscher Wetterdienst (DWD), communication dated 17 November 2023

At a glance

- The highest number of hot days averaged across Germany were recorded in 2003, 2015, 2018 and 2022.
- Despite considerable fluctuations between individual years, the overall trend is rising significantly.
- More hot days are expected during summer months in the coming decades due to climate change.

Indicator online (latest data, data download): http://www.uba.de/57109
Detailed information: http://www.uba.de/57569
Last updated: 20.11.2023

Environmental importance

Rising temperatures can adversely affect human health. Germany's National Meterological Service, the Deutscher Wetterdienst (DWD), defines the 'hot day' as any day on which the maximum temperature exceeds 30 degrees Celsius (°C).

High air temperatures have a direct impact on the human body, as the heat can cause circulatory problems. Indirectly, hot weather can raise pollutant levels in the air we breathe, leading to an increase in respiratory and circulatory diseases. High air temperatures combined with intense sunlight encourage the formation of ground-level ozone. Ozone irritates the eyes and airways and can exacerbate existing respiratory diseases. It can also trigger allergic reactions.

Assessing the development

In 2023 Germany recorded about 11.5 'hot days', when temperatures exceeded 30 °C.

The strain on heat was also particularly high in 2003, 2015 and 2018: in these years there were between 18 to 20 'hot days' on a nationwide average. The ten hottest years based on the number of hot days all have been recorded since 1994. Although the annual figures for this indicator vary greatly, the overall trend has increased significantly since records began.

Climate models show that in the future Germany can expect an increase in the number of hot days in summer and more prolonged heat waves.

Methodology

The indicator is based on temperature measurements taken at Deutscher Wetterdienst (DWD) monitoring stations. Temperature readings and indicator values must be calculated for those areas not covered by monitoring stations. The results can be presented in a grid (1×1 km) which shows the distribution. An annual total of hot days is calculated for each grid point. The indicator is the mean of the annual values for all grid points (areal mean). For more information about the calculation method refer to a report by the DWD (Müller-Westermeier 1995, in German only).

06
Energy

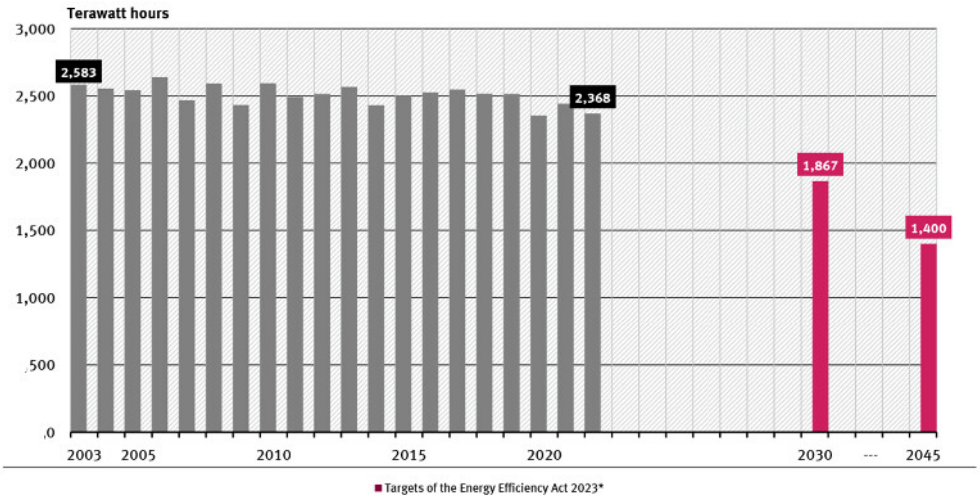
Final energy consumption

Renewable energies - Share in gross final energy consumption

Share of renewables in gross electricity consumption

Final energy consumption

Final energy consumption



* Environmental heat is not taken into account for the targets under the Energy Efficiency Act (EnEfG). This accounted for less than 1% of total final energy consumption in 2022. The final energy consumption corrected in this way is correspondingly lower.

Source: German Environment Agency based on AG Energiebilanzen, Evaluation Tables on the Energy Balance (as of 11/2023)

At a glance

- The use of energy resources (energy consumption) is associated with many negative environmental impacts.
- The figure "final energy consumption" excludes the consumption of the energy system itself and reflects the energy consumption of end consumers.
- The Energy Efficiency Act sets the target that final energy consumption should be 26.5 % lower than in 2008 by 2030 (2045: - 45 %).
- The German Environment Agency's "Projection Report 2023" shows that the measures taken to date are unlikely to be sufficient to achieve these targets.

Indicator online (latest data, data download): http://www.uba.de/106907
Last updated: 19.03.2024

Environmental importance

The term "final energy consumption" (FEC) refers to the amount of energy made available by the energy system to end consumers such as industry or private households. It does not take into account conversion and transmission losses in the energy system or non-energy consumption. The FEC therefore reflects the development of energy consumption by end users.

Energy consumption has many negative effects on the environment: Fossil fuels are often extracted with considerable environmental impact through mining. Their transportation leads to pollutant emissions and poses risks such as shipping and pipeline accidents. The conversion of energy sources in power plants or refineries is associated with the emission of large quantities of greenhouse gases and other pollutants. But renewable energies also have an impact on the environment and nature. For these reasons, energy and environmental policy strives to reduce (final) energy consumption. This also makes economic sense, as lower energy consumption also means lower energy costs.

Assessing the development

Between 2008 and 2022, the FEC according to the definition of the Energy Efficiency Act (see next paragraph) fell by around 9.3 %, with a slight downward trend. It is important to note here: As the FEC is dominated by energy consumption for heating and cooling, weather conditions have a major influence on the development of consumption.

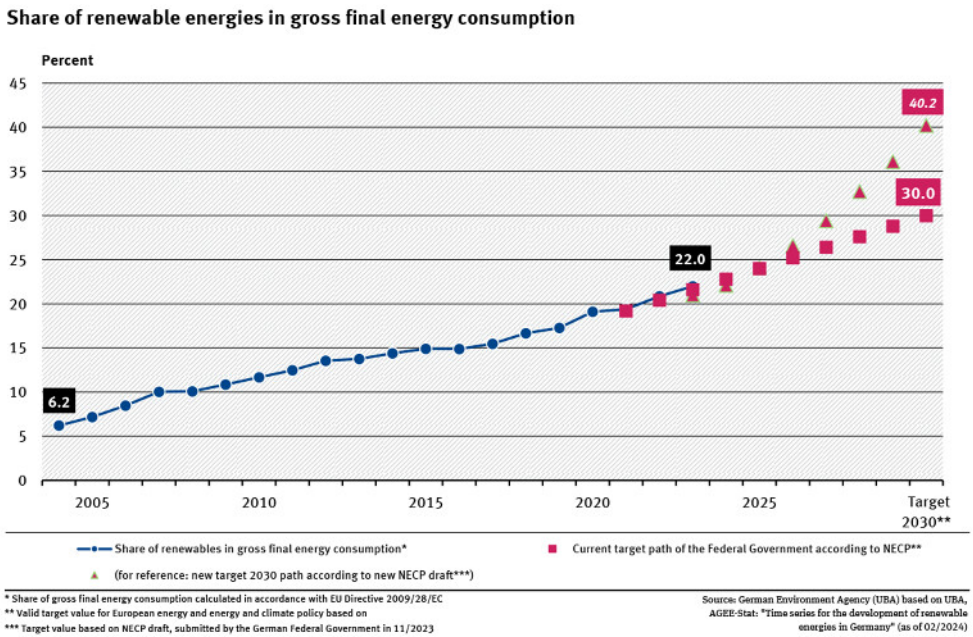
German legislators passed the "Energy Efficiency Act" (EnEfG) in the fall of 2023. The Act stipulates that FEC should fall by around 26.5 % (1,867 TWh) by 2030 and 45 % (1,400 TWh) by 2045 compared to the 2008 level.

The "Projection Report 2023 for Germany" (*German*, with English summary) examined whether Germany can achieve its energy and climate targets in 2030 on the basis of scenario analyses: If all the measures planned by the governing coalition are implemented, the FEC is expected to fall by around 16 % in 2030 compared to 2008 ('with existing measures' scenario). This would fall well short of the EnEfG target of a 26.5 % reduction by 2030. Further measures to reduce the FEC are therefore necessary in order to achieve the EnEfG targets.

Methodology

Final energy consumption is regularly calculated by the Working Group on Energy Balances (AGEB). It is based on various energy statistics surveys and modeling. The AGEB publishes methodological information on the calculation in the "Explanatory notes on the energy balances" (*in German only*). In line with the EU Energy Efficiency Directive, the EnEfG uses a slightly different definition from AGEB (excluding environmental heat harnessed by heat pumps).

Share of renewables in gross final energy consumption



At a glance

- Gross final energy consumption includes all types of final energy consumption by end consumers, primarily electricity, district heating, fuels and fuels for heat generation.
- So far, the development has been in line with the previous target of a 30 % share of renewables in 2030.
- However, as part of the new targets for the EU Renewable Energy Directive, the German target will soon be increased to 40 %. New measures will be required to achieve this target.

Indicator online (latest data, data download): http://www.uba.de/57114
Last updated: 02.04.2024

Environmental importance

Switching the energy supply to renewable energy sources is one of the most important strategies in the fight against the climate crisis. An important side effect is that Germany can largely supply itself with renewable energy sources. The expansion of renewable energies therefore reduces dependence on raw material imports.

In the public debate, the conversion of electricity generation to renewable energy sources plays a central role. The consumption of fuels for transportation and fuels for heat generation accounts for around 80 % of final energy consumption. Gross final energy consumption according to the EU Renewable Energy Directive includes all energy consumption by end consumers. In addition to final energy consumption, it also includes the power plants' own consumption and line losses.

Assessing the development

The share of renewables in gross final energy consumption has risen significantly since the start of the survey in 2004, albeit at a considerably slower rate than the share of electricity consumption (see indicator "Renewable energies - share of gross electricity consumption"). The reason for this is the significantly slower development of the switch to renewables in the heating and cooling as well as the transport sectors.

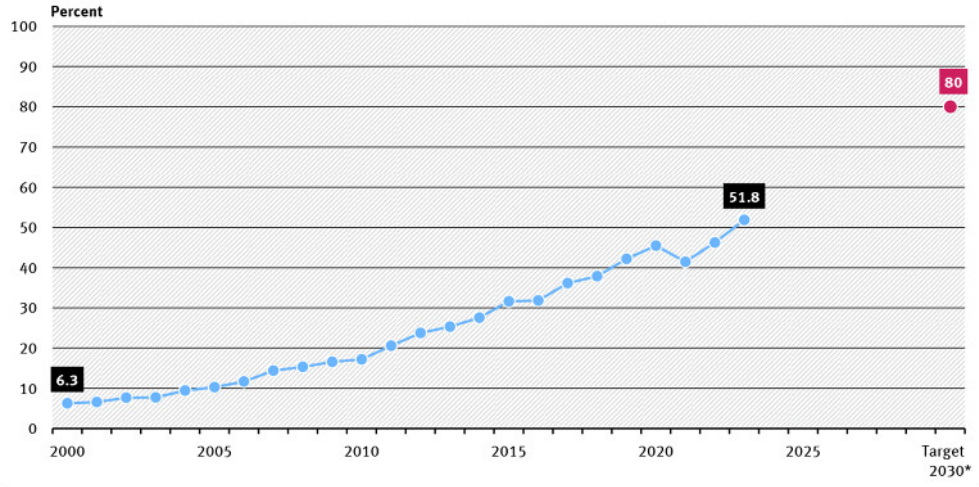
With the "National Energy and Climate Plan" (NECP), Germany committed itself in 2020 to increasing the share of renewables in gross final energy consumption to 30 % by 2030. So far, development has been on this earlier target path to 2030, but this path is now politically outdated: Germany's contribution to achieving the European renewable energy and climate targets will soon be increased to around 40 % in 2030. The background to this is that a new target was agreed in the EU's recently revised Renewable Energy Directive: EU-wide, the share of renewables in gross final energy consumption is to increase to 42.5 % by 2030, or even 45 % if possible.

Methodology

The indicator compares the electricity, district heating, fuels and other renewable energy used in Germany on the basis of renewable energy sources with total gross final energy consumption. Gross final energy consumption includes the final energy consumption of end consumers as well as transmission losses and power plants' own consumption. The data used are provided by the Working Group on Renewable Energy Statistics (AGEE-Stat, in German only) and Working Group on Energy Balances (AGEB).

Share of renewables in gross electricity consumption

Share of renewable energies in gross electricity consumption



* Source for target value 2030: Renewable Energies Act (EEG) 2023

Source: German Environment Agency (UBA) based on UBA, AGEE-Stat: "Time series for the development of renewable energies in Germany" (as of 2/2024)

At a glance

- Electricity accounts for around a fifth of the total final energy consumption. This share is set to increase in the future.
- The share of renewable energies in gross electricity consumption rose from 6.3 % to 51.8 % between 2000 and 2023.
- The German Renewable Energy Sources Act (EEG) stipulates that the share of renewable energies should increase to at least 80 % by 2030.
- If Germany achieves its ambitious expansion targets for renewable power plants, this target is realistic.

Indicator online (latest data, data download): http://www.uba.de/106900
Last updated: 02.04.2024

Environmental importance

In 2022, electricity accounted for only 20.2% of final energy consumption in Germany. However, heat generation and mobility are also set to rely increasingly on electricity in the future. The "share of renewable energies in gross electricity consumption" is therefore a key climate and energy policy indicator.

Until just a few years ago, electricity generation in Germany was predominantly based on fossil and nuclear energy sources. Hard coal and lignite in particular caused high greenhouse gas emissions. By contrast, the switch to renewable energies in electricity generation has resulted in little to no greenhouse gas emissions. In addition, electricity generation can be largely based on domestic (renewable) resources.

Gross electricity consumption comprises the net electricity consumption used by so-called end consumers such as industry or private households as well as the power plants' own consumption and grid losses. As the indicator thus fully reflects the electricity system, it is a preferred political target indicator.

Assessing the development

Renewable electricity generation has developed rapidly in recent decades. The main reason for this was the subsidisation provided by the Renewable Energy Sources Act (EEG) in Germany. In order to achieve Germany's climate targets, politics is focusing on a further sharp increase in the share of renewables in gross electricity consumption in the future. The 2023 amendment to the EEG specifies that the share should increase to at least 80% by 2030. The "Projection Report 2023 for Germany" (*German*, with English summary) scientifically investigated whether Germany can achieve its climate targets in 2030. The development of renewable electricity supply was also examined. The report shows that the share of renewables in electricity consumption could exceed 80% in 2030. However, this assumes that Germany achieves its expansion targets. So far, it is becoming apparent that this will be a major challenge, particularly in the area of wind power.

Methodology

The indicator compares gross electricity generation from renewable energies with total gross electricity consumption. The latter corresponds to gross electricity generation from all energy sources adjusted for the foreign trade balance. The data used are provided by the Working Group on Renewable Energy Statistics (AGEE-Stat, in German only) and Working Group on Energy Balances (AGEB).

07
Private households and consumption

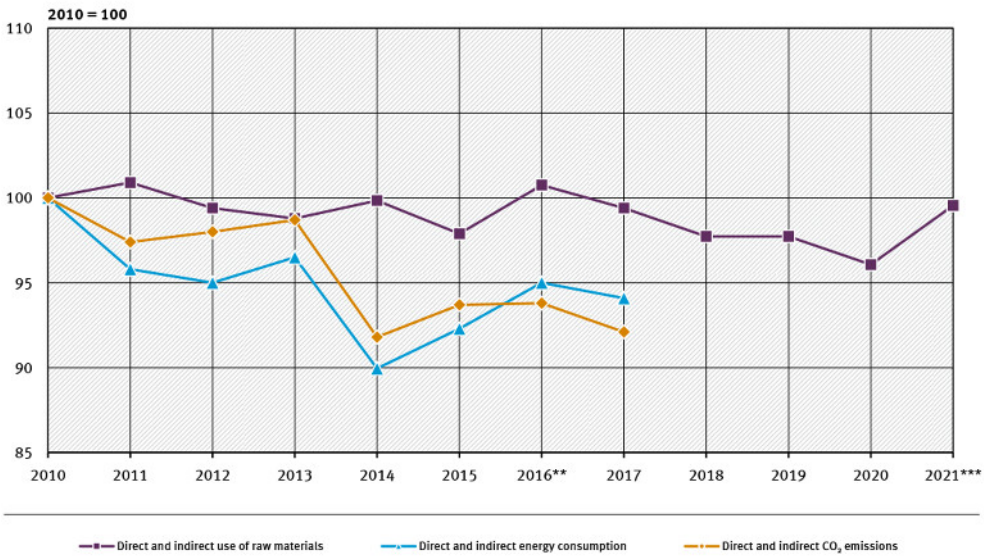
Global environment footprint of consumption

Environmentally friendly consumption

National Welfare Index

Global environmental footprint of consumption

Global environmental footprint of household consumption*



* In the German Sustainability Strategy, the German government has set itself the goal of continuously reducing the ecological footprint associated with the consumption activities of private households in all three areas
** Comparability of 2016 figures with previous years is limited due to a revision of national accounts
*** Preliminary values

Source: Federal Statistical Office 2024, Environmental-Economic Accounts, Direct and Indirect Energy Flows and CO_2 Emissions. Production and use in raw material equivalents

At a glance

- Compared with 2010, energy consumption by private households and associated carbon dioxide emissions decreased slightly overall.
- Raw material use stagnated at the level of 2010.
- In its Sustainability Strategy the German government sets the goal of reducing the global environmental footprint of private household consumption in all three areas.

Indicator online (latest data, data download): http://www.uba.de/85704
Last updated: 13.02.2024

Environmental importance

Through their consumption activities, private households significantly contribute to the environmental impact caused by the German economy as a whole. A distinction is made between direct and indirect use of environmental resources, as well as direct and indirect emissions.

Direct resource use or direct emissions respectively result, for example, through energy consumption within private households (e.g. heating) or are directly related with consumption activities such as when fuel is used for driving. By contrast, CO_2 emissions, energy consumption and raw material use resulting from the production of consumer goods are labelled indirect. These can either occur in Germany or abroad. For indirect CO_2 emissions and energy consumption, the terms CO_2 or energy content of consumer goods apply. A significant part of the indirect environmental impact of our consumption is generated abroad through the import of goods or so-called intermediate inputs.

In its sustainability strategy, the German government set the goal of continuously reducing the global environmental footprint of private household consumption in all three areas (BReg 2021, *in German only*).

Assessing the development

Direct and indirect energy consumption by private households has declined by 5.9 % since 2010, but has risen again slightly compared to 2014. Around 30.4 % of energy consumed by private households is generated abroad during the production of goods that are imported.

There is a similar trend in CO_2 emissions. Overall, CO_2 emissions from private household consumption in 2017 were 7.9 % lower than in 2010, with around 31.5 % of emissions resulting from the production of imported goods abroad.

The use of raw materials has not decreased since 2010. Usage of abiotic materials (ores, fossil fuels and other minerals) has decreased by 2,1 % since 2010 and there has been a 3.0 % increase in biomass. In total, approximately 659 million tonnes of raw materials were used for private household consumption in 2021.

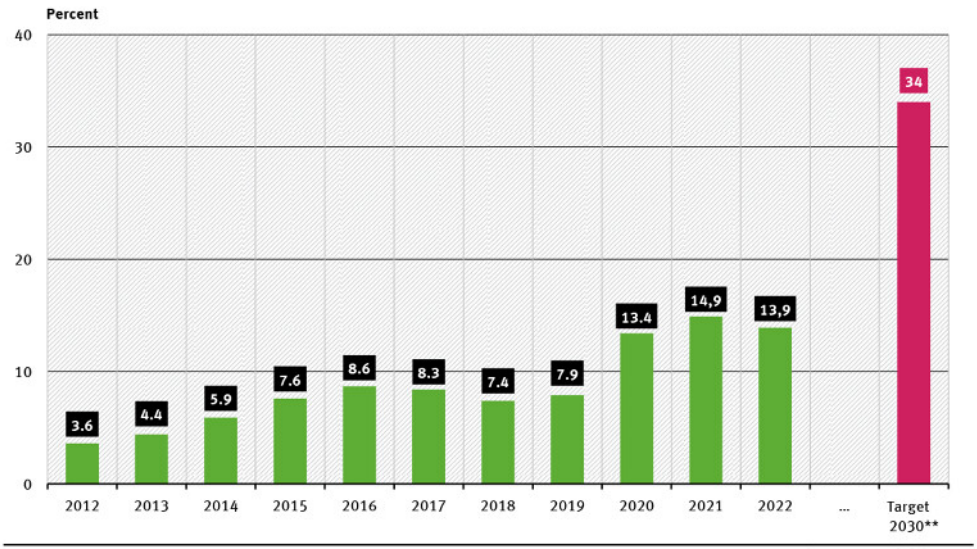
When the three sub-indicators are viewed together, the picture is mixed: While the use of raw materials is stagnating and requires further efforts to achieve the German government's target, energy consumption and CO_2 emissions are moving in the desired direction.

Methodology

Data on the global environmental footprint of private households are calculated from a number of different sources in the environmental economic accounts by the Federal Statistical Office using environmentally extended input-output analysis. The determination of indirect environmental impacts is particularly challenging, which is why new data for the indicator always comes with a delay. The Federal Statistical Office developed the basis of this indicator on behalf of the German Environment Agency as part of the research project "Global Environmental Consumptio n by Production, Consumption and Imports" and is described in a method manual (Destatis 2020, *in German only*).

Environmentally friendly consumption

Weighted market shares by sales of products* with official eco-labels



* Cars, household appliances, lighting, flats creens (best class of European energy efficiency label); food (organic certification); household and sanitary papers, detergents (Blue Angel)
** Target of the German Sustainable Development Strategy 2016

Source: German Environment Agency calculations 2024, based on various sources

At a glance

- In the sector of products with official eco-labels, 13.9 % of turnover was generated with particularly environmentally friendly products in 2022.
- The Federal Government has set the target of increasing the market share of environmentally friendly products to 34 % by 2030.
- More efforts are needed to achieve this goal, particularly in the food and mobility sectors.

Indicator online (latest data, data download): http://www.uba.de/57253
Detailed information: http://www.uba.de/11321
Last updated: 08.02.2024

Environmental importance

Private households can encourage sustainable consumption both directly and indirectly. On the one hand energy-efficient vehicles or well-insulated homes need less energy and produce fewer greenhouse gas emissions. On the other hand, by preferring environmentally friendly products, consumers indirectly influence the emissions of the production.

The indicator records the market shares of products with eco-labelling that sets stringent environmental standards. Up to now, only state-regulated eco-labelling has been considered: Energy labelling (cars, household appliances, lighting and televisions), organic labelling (food) and the Blue Angel label (sanitary tissues, washing and cleaning products). With this indicator it is possible to ascertain whether conventional products are being replaced by environmentally friendly versions. Sustainable consumption is all about replacing non-sustainable consumer habits with sustainable ones.

Assessing the development

In 2022, eco-friendly products had a market share of 13.9 % in the product groups surveyed. After a significant increase of 5.5 percentage points in 2020, it is only slightly higher in 2022 than in 2020. This is mainly due to the market share of A+ cars. In 2020, it had risen sharply from 10.0% to 27.5% due to the comprehensive government subsidy. In 2022, however, the market share of 31.2% was only a few percentage points above the 2020 figure. With a market share of 6.3% in 2022, organic food was below the 2020 figure (6.8%). In the case of large household appliances, the values of the most efficient products in the white goods segment only increased by a few percentage points. In the case of tissue paper, market shares are falling for the eighth year in a row to just 10.0% for private households. The market shares within the various product groups differ significantly in some cases. Take household appliances, for example: Washing machines with the highest efficiency class recently had a market share of 95.6%. In contrast, the highest efficiency class had a share of less than 1% for electric cookers and ovens or air conditioners.

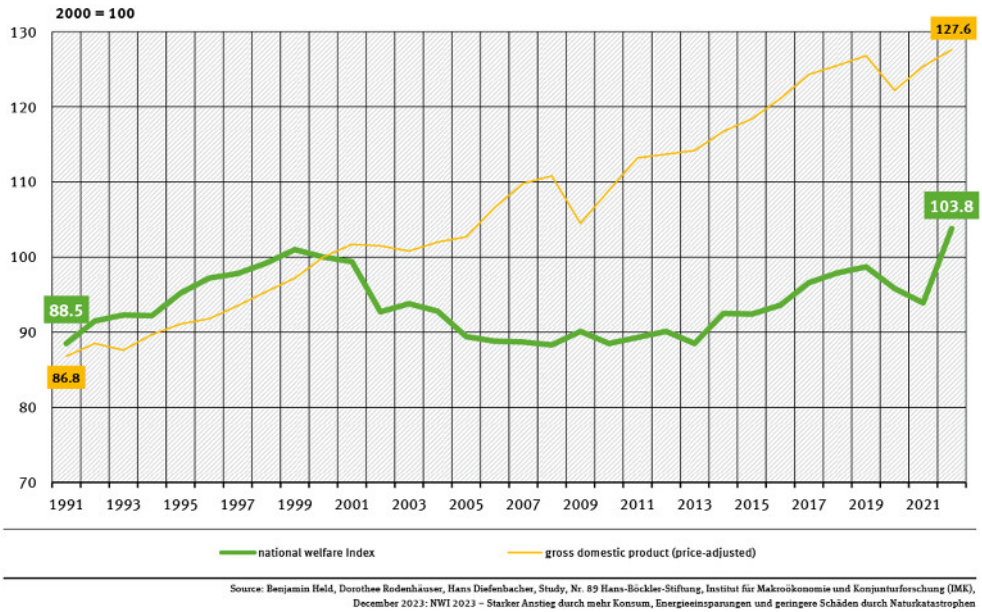
In the German Sustainable Development Strategy, the Federal Government has set targets for the market share of environmentally friendly products. These are to increase to 34 % by 2030. This target requires above all a significantly increase of sales of organic food and particularly of the market share of electric cars. The weakening or even negative growth in energy-efficient products should also be revived.

Methodology

To calculate the indicator, particularly environmentally-relevant product groups for which market data are available were identified in each consumer area. Since the market volumes for individual product groups vary greatly, the market shares were weighted by the volume of sales for the respective market as a whole. This guarantees that the indicator is not distorted by high market shares in small niche markets.

National Welfare Index

Development of the national welfare index (NWI) and the gross domestic product (GDP)



Source: Benjamin Held, Dorothee Rodenhäuser, Hans Diefenbacher, Study, Nr. 89 Hans-Böckler-Stiftung, Institut für Makroökonomie und Konjunkturforschung (IMK), December 2023: NWI 2023 – Starker Anstieg durch mehr Konsum, Energieeinsparungen und geringere Schäden durch Naturkatastrophen

At a glance

- A graph shows the national welfare index (NWI) and gross domestic product (2000 = 100) for the years between 1991 and 2022. Since 2000, the NWI fell by 3.6 percent, while GDP rose by 27.6 percent.
- The national welfare index (NWI) includes overall 21 activities that raise and diminish welfare.
- The NWI shows a different course than GDP. It fluctuates in phases, but there is no discernible long-term trend.

Indicator online (latest data, data download): http://www.uba.de/57202
Last updated: 25.03.2024

Environmental importance

GDP indicates the economic performance of an economy and has been recognised as an internationally comparable statistical parameter. However, GDP is not a suitable measure of social welfare. The main criticisms include the fact that GDP does not take into account distribution of income and does not incorporate voluntary work and housework. Furthermore, it does not include costs through damage to the environment. Thus it does not show decreases in natural capital. So-called defensive expenses to combat crime, drug use or the subsequent costs of traffic accidents or natural disasters even tend to have a positive effect on the GDP.

The NWI has been developed as an indicator that takes account of such criticism. Based on consumption expenditure, it contains bonus and malus components, depending on whether they contribute to welfare or not. Greater income inequality lowers the value of the index. Environmental costs and consumption of non-renewable resources are examples of negative categories, voluntary work and housework for positive categories. The NWI has been increasingly used by the German Federal States.

Assessing the development

The development of the NWI since 1991 shows different trends. Until 1999 a continuous increase parallel to GDP can be observed. This is followed by a disparity: While GDP continues to rise, the NWI falls. The main cause was the increasing income inequality. Between 2005 and 2013 there were hardly any fluctuations of the NWI. From 2014 on there was a positive trend. Consumer spending increased, inequality stagnated and environmental costs decreased slightly. In the pandemic year, however, both GDP and NWI fell abruptly. Whereas the GDP recovered in 2021, particularly the floods on the Ahr and Erft rivers caused the NWI to drop further. In 2022, there was a strong increase due to rising consumer spending (also due to the relief packages), energy savings and lower damage from natural disasters compared to the previous year. However, inflation and increased flight emissions dampened the increase considerably.

The increasing inequality of income distribution in the 2000s is the main reason for the fall in the NWI. Initial estimates for 2023 show a slight decline in environmental pollution, caused in particular by falling energy consumption and the associated lower emissions. However, there is a tendency towards negative developments in consumption and possibly increasing income inequality. Further information can be found in a detailed current evaluation of the NWI *(in German only)*.

Methodology

The NWI is the sum of 21 monetarily assessed components, the most important of which is real consumption expenditure weighted by the distribution of income (Gini coefficient). There are more welfare-enhancing components such as housework, volunteer work and expenditure for health and education that have a positive impact on the NWI, whereas negative activities are subtracted, such as environmental damage or crime. A more detailed description of the calculation method is found at NWI 3.0 Methodenbericht Nationaler Wohlfahrtsindex 3.0 (in German only). On the Research Institute of the Protestant Study Community (FEST) website the latest publications can be found.

08
Environment and economy

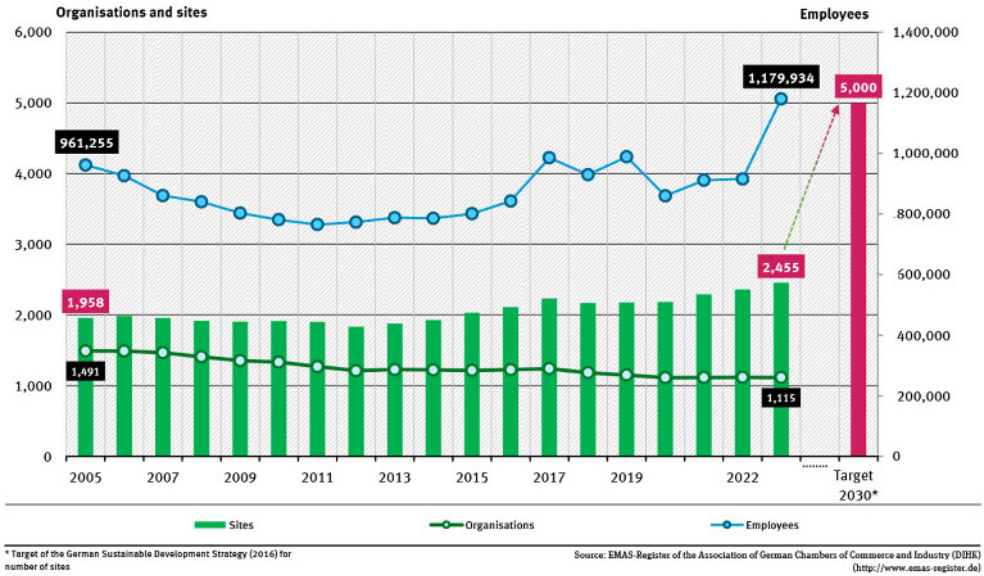
Environmental management

Environmental costs of energy and road transport

Employment in environmental protection

Environmental management

Number of EMAS-registered organisations, sites and employees



* Target of the German Sustainable Development Strategy (2016) for number of sites

Source: EMAS-Register of the Association of German Chambers of Commerce and Industry (DIHK) (http://www.emas-register.de)

At a glance

- EMAS is an internationally applicable system for environmental management. It is the most ambitious environmental management standard publicly available.
- By 2011 and 2012 respectively, the number of EMAS registered organisations, sites and employees had declined.
- A slight upward trend was then observed until 2017, which did not continue from 2018 to 2020. Since 2020, there has been a rise in the number of employees and locations.
- In its sustainability strategy, the German government has set the target that 5,000 sites should be registered according to EMAS by 2030.

Indicator online (latest data, data download): http://www.uba.de/57201
Detailed information: http://www.uba.de/22254
Last updated: 28.02.2024

Environmental importance

The number of organisations and sites registered with the Eco-Management and Audit Scheme (EMAS) and employees in EMAS-registered organisations are a measure for the acceptance of sustainable production patterns in the economy. EMAS is applicable for companies and other organisations that want to improve their environmental performance in a systematic, transparent and credible manner. The scheme's requirements are defined in the European EMAS regulation (EC regulation 1221/2009).

EMAS focuses on the environmental aspects of activities, products and services of organizations over the entire life cycle. These must be taken into account when defining and implementing processes, responsibilities and decision structures so that negative effects on the environment are continuously reduced. Progress is monitored by independent, accredited experts and reported in publicly accessible environment statements.

EMAS improves environmental protection and can help to save costs. An increased number of organisations joining the EMAS scheme will have an overall positive effect on environment, climate and resource protection. EMAS builds on the internationally widely used environmental management standard ISO 14001, but is more ambitious.

Assessing the development

After a decline until 2012, the development was positive until 2017. However, there has been a slight decline in EMAS organisations, sites and employees from 2018 to 2020. The number of EMAS-registered sites in Germany has remained constant but rose again recently. The number of employees at EMAS-registered sites grew was around 1,200,000 in 2023. In December 2023 1,115 organizations at 2,455 sites in Germany were EMAS-registered.

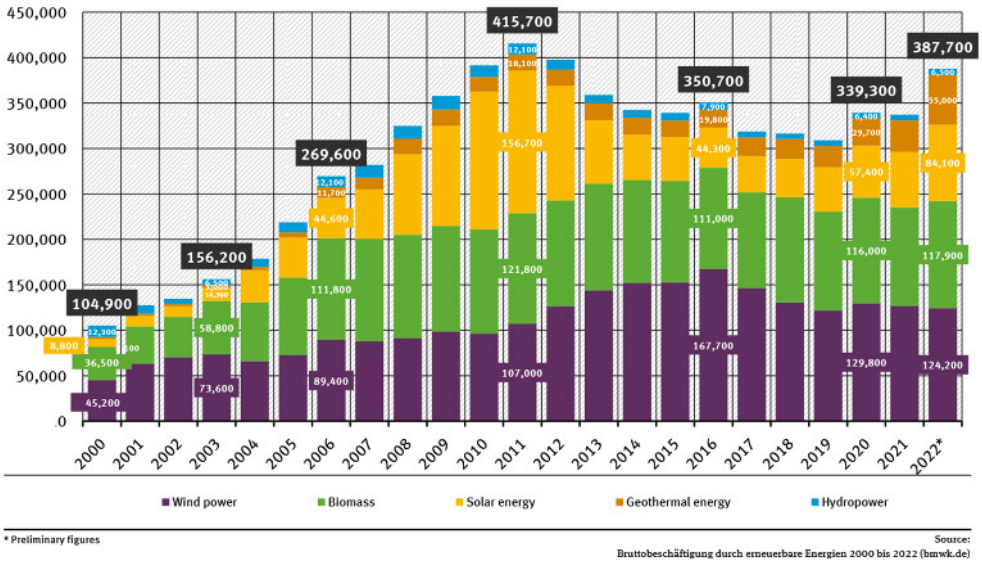
In the German Sustainable Development Strategy, the German Federal Government commits to further supporting EMAS (BReg 2016). In 2030, 5,000 sites should be EMAS-validated and registered. However, EMAS still needs more support and further steps to be taken to achieve this goal. So far, companies that are EMAS-registered have advantages in energy, water, waste and immission control legislation and can benefit from various exemptions.

Methodology

EMAS organisations and sites are registered by the competent Chambers of Industry and Commerce and Chambers of Handicrafts and enter the publicly accessible database of the Association of German Chambers of Commerce and Industry database. Data based on a unified collection method are available from 2005 onwards. The office of the German EMAS Advisory Board publishes a monthly summary of developments, based on relevant DIHK statistics.

Employment in the renewable energy sector

Number of employees in the renewable energy sector



* Preliminary figures

Source:
Bruttobeschäftigung durch erneuerbare Energien 2000 bis 2022 (bmwk.de)

At a glance

- 387,700 people worked in the renewable energy sector in 2022.
- Employment in the renewable energy sector reflects the development of the German market.
- Strong employment growth until 2011 was followed by a pronounced decline that resulted from the widespread collapse of the domestic photovoltaic industry.
- Only since 2019, employment has been rising again.

Indicator online (latest data, data download): http://www.uba.de/78005
Last updated: 11.04.2024

Environmental importance

The use of renewable energies – such as wind, solar, geothermal, hydro and biomass – is an indispensable contribution to climate protection and resource conservation. Expanding renewable energies not only benefits climate protection and the labour market. It represents an essential contribution to the security of energy supply and reduces dependency on energy imports.

The indicator shows the development of the number of people employed in the renewable energy sector in Germany: for planning tasks, for the production and maintenance of plants, for administration or for research, development and marketing.

The indicator shows the development of the number of people employed in the renewable energy sector in Germany: for planning tasks, for the production and maintenance of plants, for administration or for research, development and marketing. If renewable energies are used more intensively, this is also associated with a displacement of other energy production systems such as coal, oil and gas and thus a reduction in jobs in other economic sectors. However, model calculations and scenario analyses show that increasing the share of renewable energies also has a positive net effect on the labour market (Oehlmann et al. 2019).

Assessing the development

Between 2000 and 2022, the number of jobs in the renewable energy sector more than tripled. In 2022, the figure was around 387,700 people. Biomass and wind power now account for the largest share.

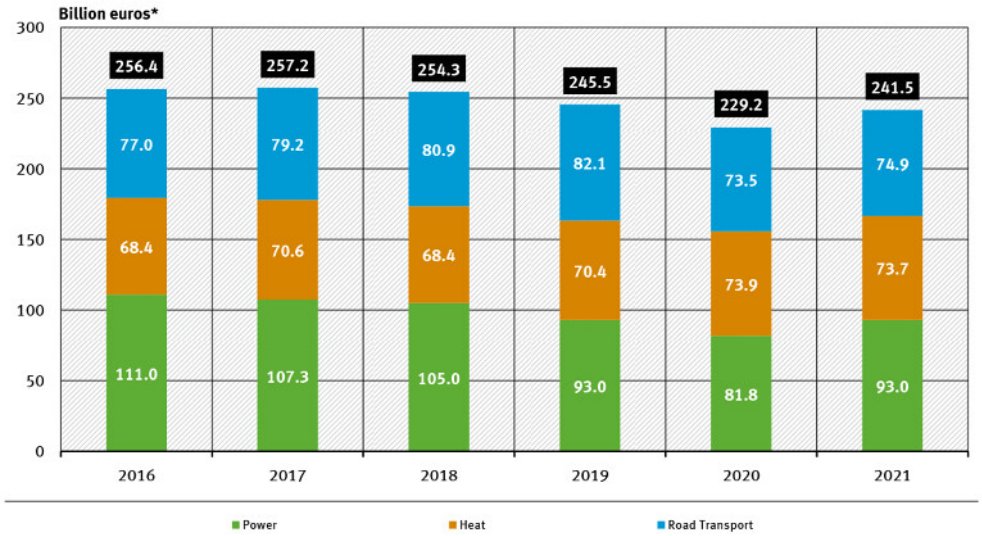
This trend, however, was subject to fluctuations rather than following a pattern of continuous increase. This was caused initially by the slump in domestic production in the most important sub-sector of the solar industry, photovoltaics. Most of it migrated to other countries – in particular to China. Wind energy maintained a steady upward trend and saw an increase in employment up until 2016. In 2017, however, there was a sharp decline in the number of employees, which continued until 2019. The main drivers for this were significant losses in foreign trade and a dramatic decline in newly installed wind turbines in Germany. Accordingly, the net capacity of newly installed onshore wind turbines fell from 4,891 MW in 2017 to 2,273 MW in 2018 and only 886 MW in 2019 (UBA 2020, *in German only*). Employment in this sector slightly recovered in the following years 2020 and 2021, and rose substantially in 2022. The other renewable energy sectors (biomass, hydropower, geothermal energy) showed only minor changes in employment.

Methodology

It is not easy to determine how many people are employed in the renewable energy sector from statistics alone. For this purpose, sophisticated estimation methods have been developed based on input-output calculations, for example. The methods and the current results are described in detail in a study commissioned by the Federal Ministry of Economics and Energy (O'Sullivan et al. 2019, in German only).

Environmental costs of energy and road transport

Environmental costs (greenhouse gases and air pollutants) of power and heat generation as well as road transport



* Based on purchasing power in 2023

Quelle: German Environment Agency 2023, own calculations based on data from Energy Balances Group and Federal Ministry for Economic Affairs and Climate Action, Time series for the development of renewable energy sources and Energy data, TREMOD 6.42

At a glance

- Power generation, heat generation and transport activities pollute the environment, among other things, through the emission of greenhouse gases and air pollutants.
- This results in high subsequent costs for society, for example through environmentally-induced diseases, damage to ecosystems or even buildings.
- For Germany, these environmental costs are estimated to amount to almost 241 billion euros in 2021, a decrease of 5.4 % compared to 2020.

Indicator online (latest data, data download): http://www.uba.de/57228
Detailed information: http://www.uba.de/21998
Last updated: 10.08.2023

Environmental importance

The use and transformation of energy resources for electricity and heat generation and road transport pollutes environment through the emission of greenhouse gases and air pollutants, e.g. particulate matter and nitrogen oxides. These cause an increase in morbidity, damage to buildings and monuments (facade pollution) and are a burden on ecosystems (cf. 'Population exposure to particulate matter pollution' and 'Agricultural nitrogen surplus'). The emitted greenhouse gases contribute to climate change. The consequences of climate change, such as an increase in heavy rainfall, thunderstorms or floods, threaten human lives and cause major damage.

This is also associated with economic costs amounting to billions, such as expenses for the restoration of storm damage. Even fifteen years after the publication of the "Stern Review," economist Nicholas Stern reiterates that the costs of inaction exceed the costs of climate protection many times over and again calls for decisive action in the fight against climate change (Stern 2006 and Stern 2021).

Assessing the development

After a particularly pronounced 6.4 % decline in environmental costs from 2019 to 2020, this trend did not continue in 2021. Environmental costs increased from 229.2 billion (bn) euros in 2020 to 241.5 billion euros in 2021. This development can probably be attributed in particular to the measures (e.g., lockdown, increase in home office) in the wake of the Covid pandemic in 2020. Although the pandemic situation also continued in 2021, the particularly drastic measures mainly affected 2020.

Comparing 2021 with the pre-pandemic year 2019 shows a slight decrease of 1.6 % in environmental costs generated by energy production and road transport.

Looking at the individual segments, it can be seen that the increase in 2021 is mainly due to the increased environmental costs of power generation (+13.7 %). At 93 billion euros, the environmental costs of electricity generation are thus back at the pre-pandemic level from 2019. In contrast, the environmental costs of road transport record a moderate increase of +2 % compared with 2020 and are also significantly lower in 2021 than the environmental costs of 2019. The environmental costs of heat generation remain constant (+0.3 %), but continue to be above the pre-pandemic level.

Methodology

Calculations of environmental damage are based on the 'Methodological Convention 3.0 for the Assessment of Enviromental Costs – Methodology' (UBA 2018, in German only). The convention helps to determine costs for the use of the environment according to uniform and transparent criteria. It takes current research into account. The 'Methodological Convention 3.1 – Cost Rates' includes cost rates for the environmental costs of greenhouse gases, air pollutants and noise as well as cost rates per kilowatt-hour of electricity and heat generated and per kilometre travelled (UBA 2020, in German only). Other adverse effects on the environment, for example in the form of land usage and water pollution, are not covered by the indicator, as no comparable cost estimates are yet available for these.

09
Transport

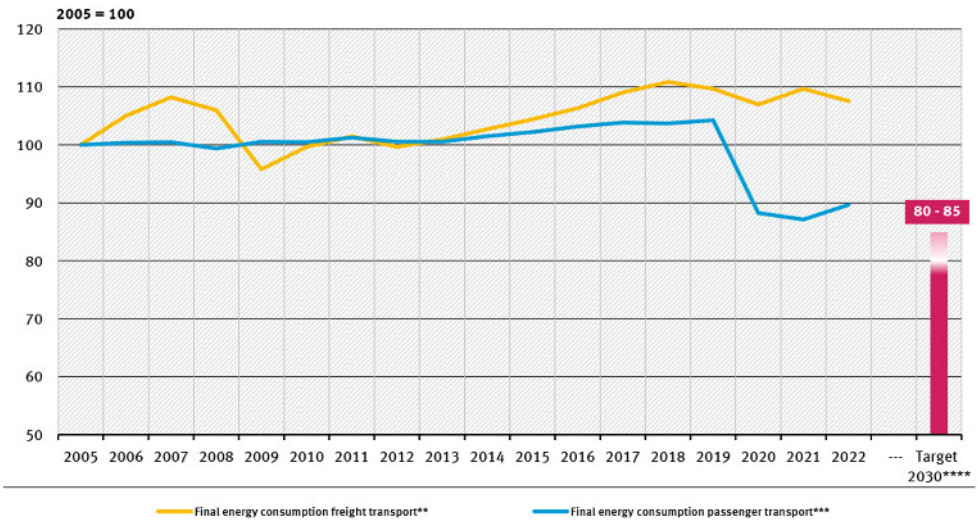
Final energy consumption in transport

Population exposure to traffic noise

Environmentally friendly passenger transport

Final energy consumption of transport

Final energy consumption of freight and passenger transport* – index (percent %)



* For this indicator transport performance and mileage are the basis to calculate energy consumption and greenhouse gas and air pollutant emissions.
** Freight transport: inland waterways, rail and road freight transport (heavy commercial vehicles: trucks from 7.5 t payload, road trains, semitrailers)
*** Passenger transport: rail, road transport, national air transport (commercial flights selected airports)
**** Target for final energy consumption freight transport and passenger transport: based on the Energy Concept of the Federal Government (2010) and the German Sustainable Development Strategy (2016)

Source: German Environment Agency 02/2024, TREMOD 6.51

At a glance

- The Federal Government wants to lower final energy consumption of freight and passenger transport by 15 to 20 % by 2030 compared to 2005.
- Freight and passenger transport have become significantly more efficient since the early 1990s, but the increased transport performance has led to an increase or stagnation in final energy consumption.
- Final energy consumption in freight transport remains at a high level. It will be difficult to reach the target.
- As a result of the pandemic, there was a significant reduction in passenger traffic and therefore in final energy consumption. In 2022, consumption increased slightly once again.

Indicator online (latest data, data download): http://www.uba.de/57189
Detailed information: http://www.uba.de/3318
Last updated: 05.03.2024

Environmental importance

Transport requires energy. Making energy available, distributing and using it are causing multiple problems in a global context.

The predominant source of energy in the transport sector is oil, which is often extracted in or transported through ecologically sensitive areas. Further energy input is needed in refining the crude oil into petrol, diesel or aviation fuel, and finally, the combustion of fuels releases pollutants such as nitrogen oxides and particulate matter. The main focus, however, is on the greenhouse gases that arise from combustion in transport and that are responsible for the global climate change.

For all these reasons, the Federal Government decided to reduce energy consumption – including the energy consumption of the transport sector. In its Sustainable Development Strategy, the Federal Government has defined the target of reducing the final energy consumption of passenger and freight transport by 15 to 20 % by 2030 (BReg 2021). The Climate Protection Act established additional sector-specific targets for greenhouse gas emissions.

Assessing the development

Final energy consumption is the consumption required to operate the vehicles. From 2005 to 2019, the final energy consumption of passenger transport increased by around 4.3 %. In freight transport, on the other hand, it rose by around 9.7 % over the same period. Nevertheless, over the same time frame, transport performance rose faster than its energy consumption. As a result, both transport sectors have become significantly more energy-efficient, however, the target of absolute energy savings was not achieved. Due to the pandemic, there was a sharp drop in final energy consumption in 2020 and 2021 as a result of the fall in passenger transport performance. In 2022, final energy consumption in passenger transport was still 10.3% lower than in 2005, but rose again compared to the previous year. However, a general trend cannot be derived from this.

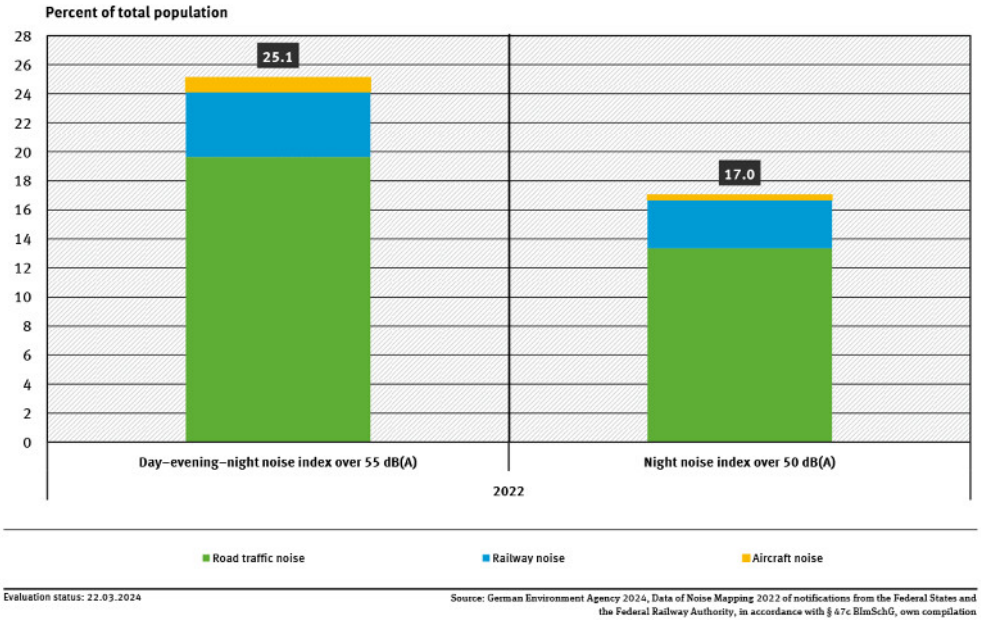
If the energy consumption of transport is to decline, the demand for transport in particular must decrease or slow down and energy-efficient alternatives have to be promoted more strongly, or transport performance must shift to more environmentally friendly modes of transport (cf. 'Environmentally friendly passenger transport' and 'Environmentally friendly freight transport').

Methodology

Final energy consumption in the transport sector is calculated using the calculation tool TREMOD (Transport Emission Model), based on mileage, traffic performance and specific energy consumption. TREMOD was developed by the ifeu – Institute for Energy and Environmental Research in Heidelberg, commissioned by the German Environment Agency. Methodological backgrounds are found on their website.

Population exposure to traffic noise

Fraction of population exposed to traffic noise



Evaluation status: 22.03.2024

Source: German Environment Agency 2024, Data of Noise Mapping 2022 of notifications from the Federal States and the Federal Railway Authority, in accordance with § 47c BImSchG, own compilation

At a glance

- According to the 2022 noise mapping, about 17.0 % of the total population was adversely affected by night-time noise.
- They further showed that 25.1 % of the population was exposed to a noise level of above 55 decibels during the day.
- The main source of noise is road traffic. Aircraft noise hardly plays a role in the area assessment.
- Noise that exceeds exposure limits can lead to health problems.

Indicator online (latest data, data download): http://www.uba.de/57235
Detailed information: http://www.uba.de/12399
Last updated: 27.03.2024

Environmental importance

Traffic noise affects the lives of a large number of people in Germany and can have severe effects on health. Noise adversely affects the quality of life and can promote cardiovascular diseases, lead to cognitive impairment, have a negative impact on the sleep quality and be associated with mental disorder. For additional information on the health effects of environmental noise, see the publication UMID 1/2016 *(in German only)*.

In 2018, the World Health Organization (WHO) published new guidelines on environmental noise for the European Region. These guidelines include source-specific recommendations for different types of transport. Herein, the WHO recommends that the noise exposure from road traffic should not exceed a mean level of 53 decibels (dB(A)) during the day and 45 dB(A) at night to avoid adverse consequences on health. According to the lowest available values used in noise mapping for measuring noise pollution, the values 55 dB(A) during the day and 50 dB(A) at night were used as threshold values for the indicator.

Assessing the development

Around major traffic routes and large airports, as well as in metropolitan areas, about 14.2 million people were affected by traffic noise above 50 decibels (dB(A)) at night, according to the 2022 noise mapping. All day, about 20.9 million people were exposed to traffic noise above 55 dB(A). Thus, 17.0 % of the population was affected by night time noise and 25.1 % by day time noise.

The different types of transport produce different noise problems: The main source of noise is road traffic. Overall, only few people are affected by aircraft noise.

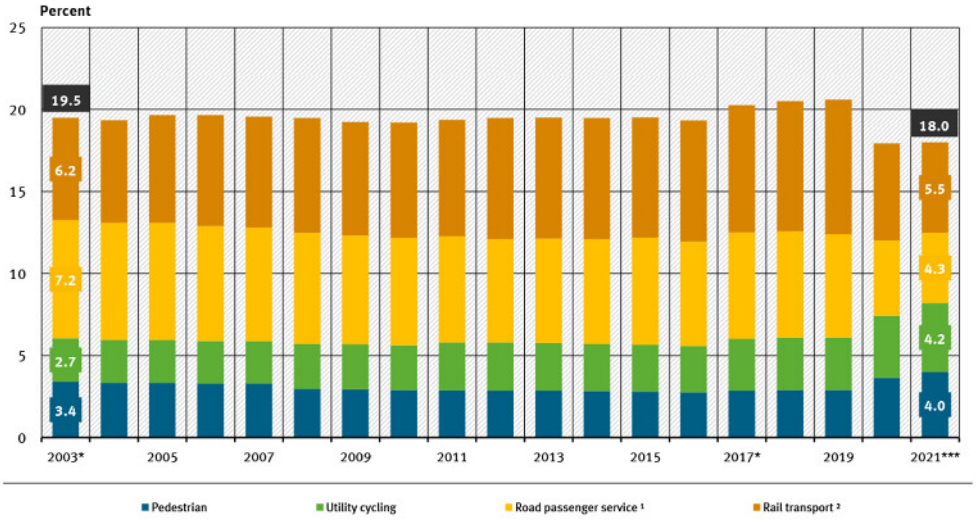
In 2021, the European Commission adopted the "Zero Pollution Target" (COM 2021). This stipulates that the number of people suffering from chronic exposure to traffic noise is to be reduced by 30 % by 2030. Compared to 2017, the situation has improved only marginally. The European Commission's zero-pollutant target will therefore very likely be missed. Numerous measures have already been taken. However, further efforts are needed to significantly reduce noise pollution.

Methodology

The basis for calculating the indicator is noise mapping, which has been enshrined in the Federal Immission Control Act (BImSchG) since June 2005. Noise maps are the basis for informing the public and for noise action plans. In the European Union (EU), noise mapping is done by means of a uniform procedure based on the standards of the European Environmental Noise Directive. Noise maps have to be drawn up for agglomerations, major roads, major railways and major airports.Detailed calculation instructions can be found in several method documents published by the Federal Government (BMU, BMVI 2021, in German only).In agglomerations, double counting of people occurs to a small extent along roads with trams, since noise pollution from road traffic and rail traffic are recorded separately.

Environmentally friendly passenger transport

Share of pedestrian, utility cycling, railway and passenger transport services of total passenger transport performance*



* Results from 2003 and from 2017 are not entirely comparable to those of previous years (recalculation and changes in differentiation)
** From 2014 onwards determined by microcensus on the basis of the 2011 census
*** Provisional data
¹ Contains among others public busses, tram, subway services

Source: Federal Ministry for Digital and Transport, Verkehr in Zahlen 2023/2024, p. 229 and various years; in German only; Information by the DIW from 25.04.2016 (for in-between years for which no figures have been published)

At a glance

- The share of environmentally friendly passenger transport has remained more or less constant since 2003, only slightly increasing until 2019 and reaching 20.6 %. Due to the pandemic it decreased in 2020 and 2021 to around 18 %.
- To keep the environmental impact of passenger transport low, the share of environmentally friendly transport in total passenger transport should be as high as possible.
- The Federal Government's National Cycling Plan is to support cycling as a means of transport; a federal strategy for pedestrian traffic is currently under development.

Indicator online (latest data, data download): http://www.uba.de/57190
Last updated: 12.02.2024

Environmental importance

Passenger transport has long been dominated by the car, what is known as individual motorised transport (IMT). In 2019 the IMT share was at 73.6 %, its transport performance increased significantly in the last years (until 2016). The share of motorised private transport was 73.6 % in 2019, and its transport performance has increased significantly in recent years (up to 2016). Air transport had a share of just under 6 % in 2019. In 2020 and 2021, the share of motorised private transport even rose to around 80% due to the pandemic, with public transport and air traffic in particular declining significantly. It should be noted that a recalculation of the mileage and consumption calculation and the passenger transport model was carried out from 2003 and 2017 onwards, which somewhat limits comparability with previous years.

Car traffic is a heavy burden on the environment through greenhouse gas emissions, air pollution and noise. In addition, stationary as well as moving traffic takes up space. Overall, apart from aviation, public transport modes have a better environmental balance than cars with average occupancy. The use of bus, train, walking and cycling have been summed up under the term 'Umweltverbund' or eco-mobility. The indicator shows the share of eco-mobility in passenger kilometres travelled. This share should be as high as possible.

Assessing the development

Our mobility is increasing. Between 1976 and 2019, passenger transport almost doubled in Germany, to recently around 1.246 billion passenger kilometres. While in 1976 the share of environmentally friendly transport modes was around 24 %, it has fallen to 20.6 % by 2019, and due to the pandemic 2020 and 2021 to around 18 % in 2020.

The "National Cycling Plan" (NRVP) was developed to promote cycling, and the new NRVP 3.0 was presented in 2021.The NRVP also supports pilot projects at the intersection of cycling and walking. The Federal Ministry of Transport, Building and Urban Affairs is currently developing a strategy for the federal government, particularly for strengthening the safety and attractiveness of pedestrian traffic.

Ultimately, the traffic performance of the MIV in absolute figures is decisive, as well as the shares of fossil fuels in fuel consumption. This has a significant influence on the development of energy consumption and transport emissions (cf. Greenhouse gas emissions, *in German only*). Progress so far has not been sufficient.

Methodology

Official statistics by the Federal Statistical Office of Germany do not actually monitor motorised individual transport, walking or cycling. Instead, the figures are approximated by the German Institute for Economic Research (DIW) using a passenger transport model. This model is based on results of the 'Mobilität in Deutschland' (BMVI 2018, in German only) survey and the 2011 microcensus. A more detailed description of the method can be found in the yearly published 'Verkehr in Zahlen' (BMDV 2023, in German only).

10
Agriculture and forestry

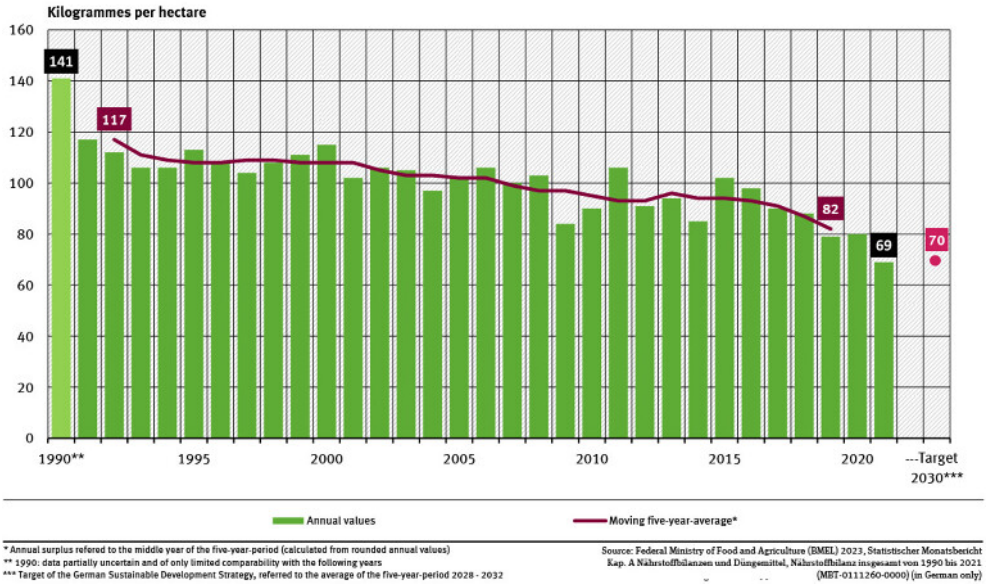
Agricultural nitrogen surplus

Organic farming

Grasslands

Agricultural nitrogen surplus

Nitrogen surplus of the national farm-gate balance



* Annual surplus refered to the middle year of the five-year-period (calculated from rounded annual values)
** 1990: data partially uncertain and of only limited comparability with the following years
*** Target of the German Sustainable Development Strategy, referred to the average of the five-year-period 2028 - 2032

Source: Federal Ministry of Food and Agriculture (BMEL) 2023, Statistischer Monatsbericht Kap. A Nährstoffbilanzen und Düngemittel, Nährstoffbilanz insgesamt von 1990 bis 2021 (MBT-0111260-0000) (in German only)

At a glance

- The five-year average of nitrogen surplus of the total balance per hectare of utilized agricultural land has decreased by 30 % since 1992.
- The Federal Government aims to reduce the average nitrogen surplus of the total balance of the years 2028 to 2032 to 70 kilogrammes per hectare of agricultural land.
- If the trend of the last 10 years continues, the target will be reached.

Indicator online (latest data, data download): http://www.uba.de/57192
Last updated: 16.10.2023

Environmental importance

Nitrogen is an essential nutrient for all living organisms. However, excessive input of reactive nitrogen compounds to the environment has serious effects on the climate, biodiversity and landscape quality. For example, nitrogen which is not utilized by plants or is converted back into atmospheric nitrogen may lead to pollution of the groundwater, nutrient enrichment (eutrophication) of waterbodies, acidification of terrestrial ecosystems and the formation of greenhouse gases. An introduction to the issue of nitrogen surplus is given in the publication 'Reactive nitrogen in Germany' (UBA 2015) and in the UBA-Umweltatlas "Reaktiver Stickstoff" (*in German only*).

In Germany problems occur especially in regions with high livestock density: Due to the high amount of farm manure (animal excrements), often more nitrogen is applied to the fields as the crops can convert into biomass. The nitrogen surplus is an indicator of the potential nitrogen losses from agriculture to the environment.

Assessing the development

Between 1992 and 2019, the 5-year average nitrogen surplus of the total balance per hectare of agricultural land decreased by around 30 %. Farmers are using nitrogen more efficiently, the area of cultivation of high-output crops has increased and feed conversion by domestic animals has improved.

In recent years, the implementation of more effective agricultural fertilisation legislation, a reduction in animal numbers, years of drought and higher prices as well as lower sales figures for mineral fertilisers have also had an impact. If the trend of the last 10 years were to continue in this way, the goal of the sustainability strategy would be achieved (BReg 2016).

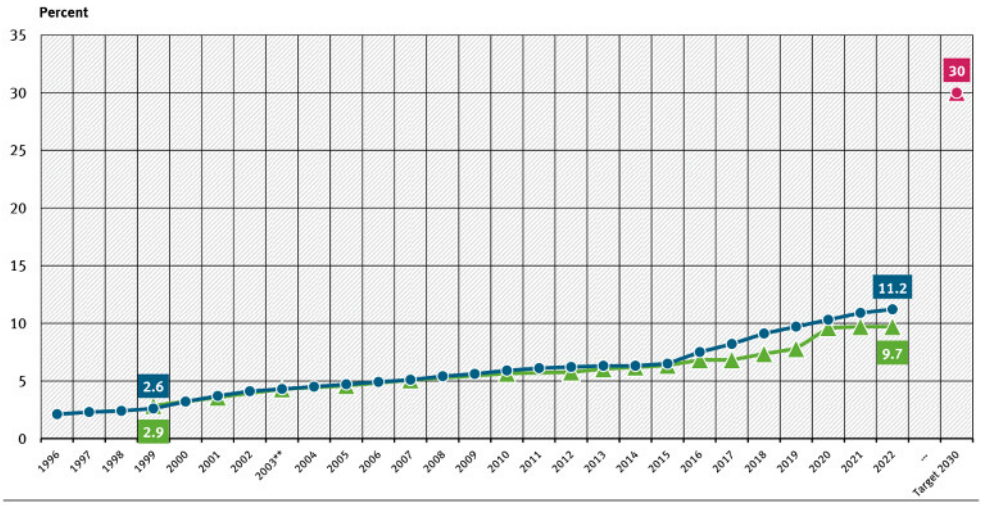
But the nitrogen balance also shows: almost half of the nitrogen used does not end up in the products, so nitrogen efficiency is still relatively low (BMEL 2023, Statistischer Monatsbericht, MBT-0111260-000, *in German only*). The need for further action to reduce nitrogen in the environment is also shown by the indicators " Nitrate in groundwater" and "Nitrogen eutrophication", which are closely linked to the nitrogen surplus and do not indicate any positive trends.

Methodology

The nitrogen surplus is determined from the total agricultural nitrogen balance. It is the difference between the input (e.g. fertiliser, feed, seed and seedlings, atmospheric inputs) and the output (animal and plant products) of the national farm-gate balance. The data are calculated by the Julius-Kühn-Institute and the University of Gießen and are published annually by the BMEL ((BMEL 2023, Statistischer Monatsbericht, MBT-0111260-000, in German only). Hints to the calculation method can be found in Bach et al. 2011 (in German only) and Häußermann et al. 2019 (in German only). The data are published annually by the Federal Ministry of Food and Agriculture (BMEL). In order to adjust for annual fluctuations a five-year moving average is calculated from the values of the individual years with the two previous and two following years.

Organic farming

Share of organic farming in total utilised agricultural area



* The data of the Federal Statistical Office is collected only every three years and estimated for the missing years since 2012. This method is not applicable for the Länder. At the federal state level, values are only available for the years collected.
** Only limited comparison possible with previous years due to a change to the survey boundaries in Thuringia.

Source: Federal Ministry of Food and Agriculture 2023. Federal Statistical Office 2023

At a glance

- According to the data of the German Federal Statistical Office, the share of area under organic farming of agricultural land increased from 2.9 % to 9.7 % from 1999 to 2022.
- The Federal Government aims to increase the proportion of organically cultivated areas in agricultural land to 30 % by 2030.
- At the growth rate of recent years, this aim is expected to be missed in 2030.

Indicator online (latest data, data download): http://www.uba.de/57196
Detailed information: http://www.uba.de/10952
Last updated: 07.08.2023

Environmental importance

Conventional intensive agriculture causes a range of environmental impacts and is partly responsible for a loss of biodiversity. Organic agriculture is a more environmentally sustainable and ecologically beneficial type of management. The aim is to close nutrient cycles as far as possible and to manage in harmony with nature.

Organic farming does not use any mineral fertilisers. A range of crop rotations with intercropping maintain and support soil organisms and soil fertility. Avoiding the use of synthetic chemical pesticides enhances biological diversity on agricultural land. A more species-appropriate animal husbandry serves animal welfare and ensures acceptance by the general public. Organic agriculture therefore has a pioneering role in sustainable land management.

Assessing the development

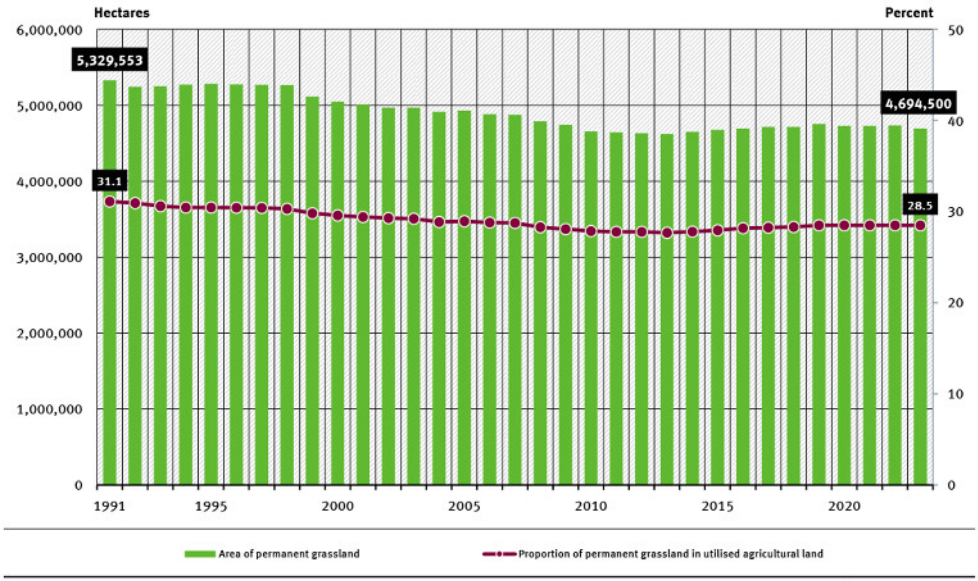
The share of organically managed areas has increased from 2.9 % to 9.7 % in the period from 1999 to 2022. According to that, the total area of organic farming has shown a small but steady increase over the period reviewed. In its decision of principle 2022, the German Federal Government agreed to raise the target for the share of organic agriculture from 20% to 30% in 2030. This new target is already included in the Indicator Report 2022. However, Germany has a long way to go to reach the target: even if the increase were to continue at the level of the past years, the 30% target would not be reached in 2030. Thus, it is important to identify obstacles to growth in organic farming and take efficient measures to eliminate them. Planning security and continuous support are needed to increase the willingness of farmers to convert to organic farming on a permanent basis.

Methodology

The German Federal Statistical Office uses various surveys (including the Agrarstrukturerhebung, Bodennutzungshaupterhebung) to determine the area that is organically farmed. The survey covers organically farmed areas of farms larger than five hectares that are subject to the control procedure of the EU legislation. The reference used to calculate the area share is the agriculturally used area (again from five hectares upwards). A slightly different data set is used by the Federal Ministry of Food and Agriculture (BMEL). The indicator covers areas that are managed in accordance with the European Eco-Basis Regulation and are reported to federal state authorities. Small enterprises below a size of five hectares are also included. For the calculation of the share, however, these are related to the total agricultural area (five hectares or more). For methodological reasons, the data of the BMEL therefore show a higher proportion of organically farmed area. The area shares of organically managed land based on BMEL statistics shows a slight increase to 11.2 % for 2022.

Grasslands

Total area of permanent grassland and proportion of permanent grassland in utilised agricultural land



Source: Federal Ministry of Food and Agriculture, Statistisches Jahrbuch (various years; in German only);
Source 2023: Federal Statistical Office of Germany 2024, Agricultural holdings, utilised agricultural area: Germany, years, types of land use
(under: https://www-genesis.destatis.de/datenbank/beta/statistic/41271/table/41271-0003/)

At a glance

- Between 1991 and 2023 the area of grassland in Germany decreased by around 12 %.
- The area of permanent grassland has almost remained at the same level in recent years.
- The loss of grassland was largely halted with the 2014 agricultural reform, and the area of grassland has not fallen below the 2013 level since then. Effective steps are required to achieve this target.

Indicator online (latest data, data download): http://www.uba.de/57193
Detailed information: http://www.uba.de/13793
Last updated: 08.01.2024

Environmental importance

Extensively managed grassland is important for species-rich plant communities that require nutrient-poor soils and which have become rare in agricultural landscapes. Approximately 40 % of the endangered ferns and flowering plants in Germany are found in grassland. But grasslands are also important for protecting soils and water and help to protect the climate by storing carbon. Permanent grassland is of particular value. It is defined as meadows and pastures that have not been used as arable land for at least five continuous years. The loss of grasslands between 1991 and 2013 was due to more intensive agriculture and the associated changes in land use. Using grasslands for pasture and hay had become less attractive to farmers while there was a growing demand to cultivate the land for feed and energy plants. Many farmers therefore increasingly used former pastures and meadows as arable land. Semi-arid grasslands and humid grasslands were ploughed and converted into arable land. If these areas are then used for intensive arable agriculture, the above-mentioned positive effects of grassland are lost. Furthermore low yielding and remote grasslands are at risk of being abandoned due to not being economically viable (land abandonment). Such grasslands may convert to shrub lands and lose their function as habitat for rare plants and animals adapted to them.

Assessing the development

Permanent grassland in Germany has been under pressure in recent decades. In 1991 there were still over 5.3 million hectares (m ha) of utilised agricultural land managed as permanent grassland. By 2023, the total area of permanent grassland had declined by 12% to around 4.7 m ha. With the EU agricultural reform of 2014, the preservation of permanent grassland was regulated via the "greening" requirements as a prerequisite for area-linked direct payments. The loss of permanent grassland was to be stopped with a general permit requirement for the conversion of permanent grassland and a complete ban on conversion and ploughing for permanent grassland worthy of special protection. In the current CAP funding period (in effect since January 2023) the preservation of grassland is also ensured through so-called conditionality in the first pillar. Farmers who receive direct payments are only allowed to convert their grassland under certain conditions and only with permission. In addition, some federal states (e.g. Baden-Württemberg, Schleswig-Holstein) have state laws that generally prohibit the conversion of grassland. Although the percentage of grassland has risen again slightly since 2013 or almost remained at the same level most recently, the overarching drivers of grassland conversion remain largely unchanged. This applies in particular to the high demand for arable fodder, the promotion of the cultivation of energy crops, the land consumption of settlement and transport and the abandonment of use. It can therefore be assumed that we will see continued pressure on grassland. Effective grassland protection thus remains of paramount importance.

Methodology

The indicator is based on the results of the 2023 Land Use Survey of the Federal Statistical Office. The results are published in Table 41271-0003 and in the Statistical Yearbook of the Federal Ministry of Food and Agriculture and on the Federal Statistical Office's website. A detailed description of the method is given in the quality report on the agricultural census (Destatis 2022, in German only).

Methodology for the assessment of indicators

Indicator system

The Environmental Monitor provides an overview of assessments on the development of the state of the environment and on progress in important environmental policy fields of action. The Environmental Monitor's indicator system covers 10 environmental topics, each with three headline indicators. The environmental topics are subdivided into five environmental topics related to protected assets and five environmental topics related to fields of action:

- Environmental topics related to protected goods:
  - Air
  - Water
  - Land, soil and terrestrial ecosystems
  - Conservation od resources: raw materials and waste
  - Climate
- Environmental topics related to fields of action:
  - Consumption
  - Environment and economy
  - Energy
  - Agriculture and forestry
  - Transport

The assessment of the indicators is based on determining whether the development is moving in the desired direction or whether sufficient progress towards a specific goal can be identified. For example, a decrease in resource consumption or an increase in efficiency is assessed positively. The development can also be measured against quantitative targets, e.g. limit values for pollutant levels that are harmless to health or the environment. Finally, targets can apply at present (e.g. limit value for nitrate in groundwater) or be defined for a year in the future (e.g. reduction target for greenhouse gas emissions by 2030). Quantitative targets for a specific target year apply to 21 indicators. There are so-called directional targets for 9 indicators.

An important selection criterion for the Environmental Monitor's headline indicators is therefore that the indicators can be assigned a quantitative target or a desired direction of development on the basis of which the assessment can be made.

Assessment standards

How has the state of the environment developed over the last five years? How can progress towards environmental policy goals be assessed? The Environmental Monitor provides answers to these questions and shows a picture of the transformation towards sustainability.

To this end, both developments in the environmental status of the protected goods and progress in achieving environmental goals in important fields of action are assessed. The German Environment Agency uses an assessment procedure that takes into account the various target types and provides a comprehensible assessment in four color categories (extended traffic light system: green, yellow, orange, red).

The assessments follow a methodically standardized procedure, but can be supplemented or replaced by expert assessments in technically justified cases. This is documented transparently

The assessment of the indicators is an evaluation of the development in the recent past up to the current value. The assessment is based on the extent to which the indicator is on track, i.e. has moved in the direction of a "target-compliant" development. For indicators with a quantitative target, progress over the last five years is assessed as standard. For indicators with directional targets (e.g. welfare index should increase), both the long-term development (since 2010) and the short-term development in the last 3 years (2 changes) are used as standard for the assessment. There is no forecast or projection into the future.

Assessment of indicators with directional targets

For indicators with a directional target, a development direction (usually rising or falling) is set. The extent to which the indicator has developed into the "correct" direction is therefore relevant for the evaluation. The long-term historical trend and the last two changes are used for the assessment. Both trends are then compared with the required target direction and the indicator is finally evaluated.

The long-term trend is calculated using simple linear regression, usually starting in 2010 (or the next available year). The long-term trend is considered to be in line with the target if the slope of the regression line corresponds to the required target direction. The short-term trend is considered to be in line with the target if the last two changes are in the desired direction. The short-term development is given greater weight in the assessment in order to focus on the progress made in recent years.

Short-term and long-term target direction is given ⇢ green rating

Target direction short-term is given, long-term is not given ⇢ yellow rating

Target direction long-term is given, short-term is not given ⇢ orange rating

Target direction neither short-term nor long-term is given ⇢ red rating

Indicators with quantitative target values

a) The goal is in the future

The environmental monitor is intended to measure progress – the transformation towards good environmental quality or the achievement of environmental action targets. The extent to which the indicator is "on track" towards the desired goal is therefore relevant for the evaluation. For this purpose, a target-compliant (hypothetical) development path is defined and the development achieved to date is compared with a "target-compliant" development.

Two specifications must be made for the definition of the development path in line with the target: the reference point in time from which progress is to be measured and the design of the development path. By default, we assess the development of the indicators in the last 5 years before the most recent value and use a uniform linear change as the basis for the target-compliant trajectory, starting at the reference point in time up to the target in the target year.

For the evaluation, the actual development over the last five years is set in relation to the necessary development along the target path. The ratio between actual and necessary development marks the degree of progress and can also be interpreted as current target achievement.

- Progress of 100 % means that the development over the last 5 years has been successful and the currently achieved value is on track. In other words, the average annual development over the last 5 years corresponds to the necessary development in accordance with the target path.
- Progress of 0 % means that the indicator has not developed in the direction of the target; a value of less than zero means that the gap to the target has widened in the last 5 years (regression).

Example:

For the indicator "Greenhouse gas emissions", the current value for 2023 is available. We consider the progress for the period 2018 (t-5) to 2023 (t). The emission reduction target for greenhouse gas emissions by 2030 would be achieved if GHG emissions fall by an average of 34.5 million tons per year from 2018 to 2030. We take this development as the target path. From 2018 to 2023, they fell by an annual average of 35.5 million tons. This results in progress of 103% (35.5/34.5 = 1.03 = 103%). Progress over the last five years has therefore been sufficient and the indicator is rated green (see legend at the end of the section).

b) The target already applies

If the target is met, the indicator is rated "green". In the event that the target already applies (e.g. limit value for nitrate in groundwater) but is currently not being met, progress over the last 5 years is also considered by default. The result for progress shows the extent to which the distance to the target has changed.

- A positive value for progress means that the distance from the target has decreased in the last 5 years.
- A value of 0% or less than 0% means that the distance to the target has not changed or has even increased.

Expert judgments and deviations from the standard assumptions

The indicators of the Environmental Monitor are diverse in many respects. This applies to the underlying targets, the timeliness of the data, the measurement methodology, the scope of the time series and the timeframe of possible changes. Nevertheless, in order to provide an "at a glance" picture of the development of the state of the environment and the progress made in achieving environmental goals, the assessment is generally carried out in accordance with the standard assumptions.

Deviations from the standard assumptions and expert judgments are possible and must be professionally justified and documented.

Examples:

The time periods for the short and long-term development and for the assessment of progress are generally determined as described above. For technical reasons, it may make sense to choose other time periods. For example, longer time periods are considered for climate indicators. A break in methodology can be a reason for shortening the time period under consideration. In the case of annual special effects, it may make sense to shift the reference year or to form moving averages, e.g. if the assessment is obviously only determined by the choice of reference year. The linearity of the target paths can be deviated from, for example, if other target paths are already included in the objective (e.g. interim targets, non-linear developments,

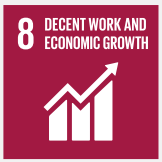
growth targets or higher progress at the beginning of the development). An expert assessment may also be necessary if too few data points are available.

Assessment key

Rating	EXPLANATORY NOTE
	Green indicates that the indicator is currently on a successful course or only deviates from it by a maximum of 5%. Progress over the last five years has been successful and is between 95% and 100%. For indicators with a directional target, green indicates that this past development has headed in the desired direction both in the long term and in recent years.
	Yellow indicates that the indicator is currently deviating slightly from the successful course. Progress in the last five years was slightly too low and lies between 80% and 95%. For indicators with a directional target, yellow indicates that the development in the past has not been as desired over the long term, but has been moving in the desired direction in recent years.
	Orange indicates that the indicator is currently deviating significantly from a successful course. Progress in the last five years was clearly too low and is between 30% and 80%. In the case of indicators with a directional target, orange indicates that the past development has been as desired over the long term, but has no longer been moving in the desired direction in recent years.
	Red indicates that the indicator is currently deviating very significantly from the course. Progress over the last five years has been below 30% or even negative if the indicator has moved away from the target. For indicators with a directional target, red indicates that the indicator has developed in the opposite direction in the past, both in the long term and in recent years.

The Environmental Indicators and the 2030 Sustainable Development Goals

The table shows the allocation of the Environmental Monitor Indicators to the Sustainable Development Goals (SDGs) of the 2030 Agenda. An overview of all sustainability indicators of Germany and the United Nations (UN) can be found on the SDG platform of the Federal Statistical Office at: https://sdg-indikatoren.de/en/.

SDG	Indicators of the Environmental Monitor
	Organic Farming Agricultural nitrogen surplus
	Population exposure to particulate matter pollution Population exposure to traffic noise Emission of air pollutants Air quality in agglomerations
	Nitrate in groundwater Ecological status of rivers
	Final energy consumption Renewable energies - Share in gross final energy consumption Share of renewables in gross electricity consumption
	Total raw material productivity National Welfare Index Environmental costs of energy and road transport

SDG	Indicators of the Environmental Monitor
	Employment in the renewable energy sector
	Final energy consumption of transport Land-take for settlements and transport infrastructure Environmentally friendly passenger transport
	Amount of waste - municipal waste Global environmental footprint of consumption Raw material footprint Environmentally friendly consumption Environmental management
	Greenhouse gas emissions Global surface temperatures Hot days
	Plastic waste in the North Sea
	Species diversity and landscape quality Nitrogen eutrophication Grasslands

List of abbreviations

%	percent
AGEB	Arbeitsgemeinschaft Energiebilanzen / Working Group on Energy Balances
AGEE-Stat	Arbeitsgruppe Erneuerbare Energien – Statistik / Working Group on Energy Balan-ces – Statistics
BfN	Bundesamt für Naturschutz – Federal Agency for Nature Conservation
BImSchG	Bundes-Immissionsschutzgesetz – Federal Immission Control Act
GDP	gross domestic product
BMEL	Bundesministerium für Ernährung und Landwirtschaft – Federal Ministry of Food and Agriculture
BMU	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit – Federal Mi-nistry for the Environment, Nature Conservation and Nuclear Safety
BMUB	Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit – Federal Ministry for the Environment, Nature Conservation, Housing and Reactor Safety
BMVBS	Bundesministerium für Verkehr, Bau und Stadtentwicklung – Federal Ministry for Transport, Construction and Urban Development
BMVI	Bundesministerium für Verkehr und digitale Infrastruktur – Federal Ministry of Transport and Digital Infrasrtucture
BMWi	Bundesministerium für Wirtschaft und Energie – Federal Ministry for Economic Affairs and Energy
°C	degree Celsius
CO_2	carbon dioxide
db(A)	decibel
Destatis	Statistisches Bundesamt – Federal Statistical Office
DIHK	Deutscher Industrie- und Handelskammertag – Association of German Chambers of Industry and Commerce
DIW	Deutsches Institut für Wirtschaftsforschung – German Institute for Economic Research
DWD	Deutscher Wetterdienst – National Meterological Service Germany
EEG	Erneuerbare-Energien-Gesetz – Renewable Energies Act
EC	European Community
EMAS	Eco-Management and Audit Scheme
et al.	et alia (and others)
EU	European Union
EEA	European Environment Agency
FEST	Forschungsstätte der Europäischen Studiengemeinschaft - Research Institute of the Protestant Study Community
ha	hectare
HELCOM	Helsinki Commission (Helsinki-Kommission zum Schutz der Meeresumwelt im Ost-seeraum)
ifeu	Institut für Energie und Umwelt – Institute for Energy and Environmental Research

IMT	individual motorized transport
ISO	International Organization for Standardization
kg	kilogram
km	kilometer
km²	square kilometer
KrWG	Kreislaufwirtschaftsgesetz – Closed Substance Cycle Waste Management Act
LAWA	Länderarbeitsgemeinschaft Wasser – German Working Group on water issues of the Federal States and the Federal Government
m³	cubic meter
max.	maximum
mg/l	milligrams per litre
min.	minimal
µg	microgram
µg/m³	microgram per cubic meter
µm	micrometer
n. d.	no date
NEC	National Emission Ceiling Directive
NH_3	Ammonia
NMVOC	Volatile organic compounds without methane
NO_x	nitrogen oxides
NO_2	nitrogen dioxide
NWI	National Welfare Index
O_3	Ozone
OGewV	Oberflächengewässerverordnung – Surface Water Ordinance
OSPAR	Oslo-Paris Convention
PJ	petajoule
PM10	Particulate Matter 10
PM2.5	Particulate Matter 2.5
RMC	Raw Material Consumption
RMI	Raw Material Input
SDG	Sustainable Development Goal
SO_2	sulfur dioxide
t	tonne
TREMOD	Transport Emission Model
TWh	Terawatt hour
UBA	Umweltbundesamt – German Environment Agency

UGA	Umweltgutachterausschuss – German EMAS Advisory Board
UN	United Nations (Vereinte Nationen)
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization

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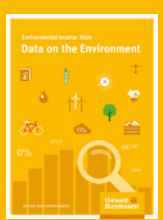

This brochure for download:
https://www.umweltbundesamt.de/publikationen/data-on-the-environment-2024

All indicators at a glance:
https://www.umweltbundesamt.de/en/data/environmental-indicators