Green Bond Impact Report 2023–2024

Federal Ministry of Finance

impact

Green Bond
Impact Report 2023–2024

December 2025

Contents

I. Overview

This Impact Report covers the Green German Federal securities issued in 2023 and 2024. The report first provides a summary of the main impacts in each of the two years (Chapter I) and then provides detailed information on each budget item (Chapter II).

In 2023, €17.25 billion in Green German Federal securities were issued. In 2024, the volume amounted to €17.5 billion (see table below). The equivalent amount of these issuance volumes was allocated to the 2022 and 2023 expenditures identified as green (hereinafter: eligible expenditures) in the respective Green Bond Allocation Reports[1]. The proceeds of the 2023 and 2024 issuances of Green German Federal securities were fully allocated. This Impact Report therefore concludes the reporting for the 2023 and 2024 issuances in accordance with the Green Bond Framework.[2]

[1] Green Bond Allocation Report 2023 (deutsche-finanzagentur.de) and Green Bond Allocation Report 2024 (deutsche-finanzagentur.de)

[2] Tap issuances of the 2023 and 2024 newly issued Green German Federal securities in subsequent years are transparently reported in the allocation and impact reports for the year of the taps. This is in line with section 4.3 of the Green Bond Framework of 24 August 2020.

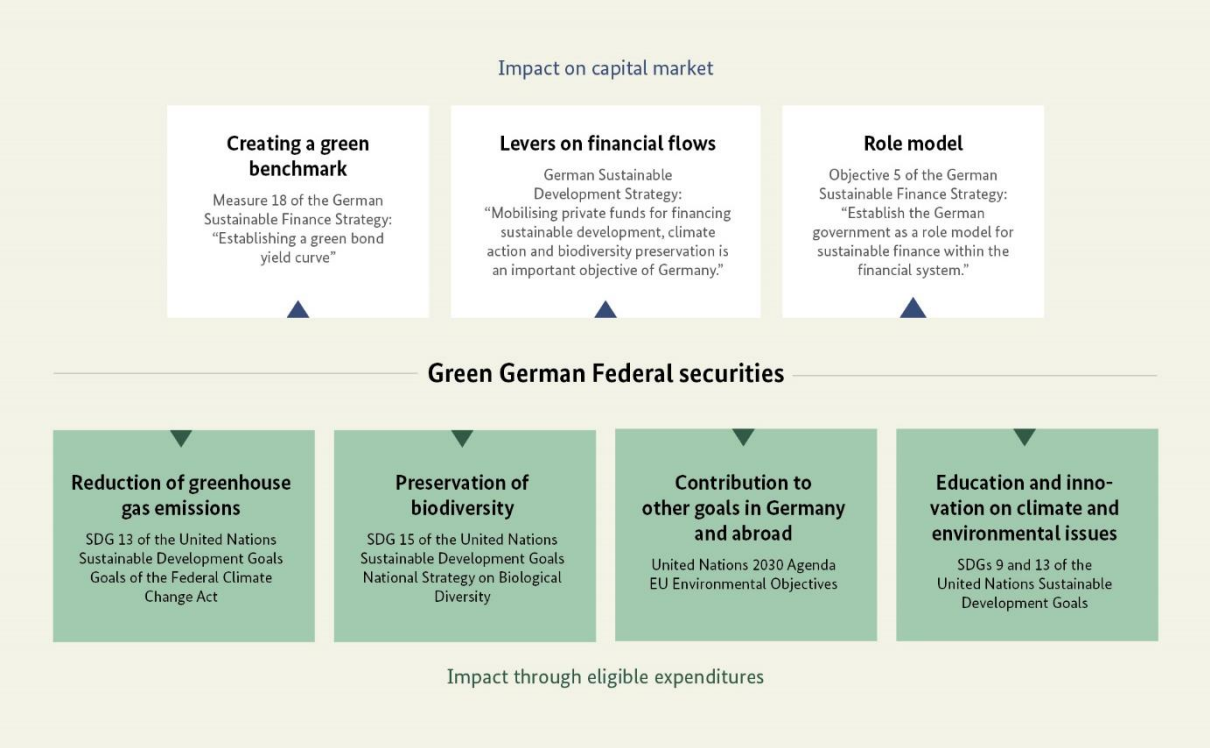
Issuance date	Type of issue	Type of security	ISIN	Issuance volume
2023				
24.01.23 07.06.23	Tap	5-year Green Federal note ("Green Bobl (Oct2025)")	DE0001030716	€2.5bn
21.03.23 30.08.23	Tap	5-year Green Federal note ("Green Bobl (Oct2027)")	DE0001030740	€3.0bn
25.04.23 05.07.23	New issue	10-year Green Federal bond ("Green Bund (Feb2033)")	DE000BU3Z005	€6.25bn
13.06.23 31.10.23	New issue	30-year Green Federal bond ("Green Bund (Aug2053)")	DE0001030757	€5.5bn
2024:				
23.01.24	Tap	5-year Green Federal note ("Green Bobl (Oct2027)")	DE0001030740	€1.0bn
23.01.24 04.06.24	Tap	30-year Green Federal bond ("Green Bund (Aug2053)")	DE0001030757	€4.0bn
27.02.24 02.07.24 20.08.24 10.09.24	Tap	30-year Green Federal bond ("Green Bund (Aug2050)")	DE0001030724	€2.75bn
26.03.24	Tap	5-year Green Federal note ("Green Bobl (Oct2025)")	DE0001030716	€1.0bn
26.03.24 28.05.24 20.08.24 08.10.24	Tap	10-year Green Federal bond ("Green Bund (Feb2033)")	DE000BU3Z005	€3.75bn
30.04.24 28.05.24 10.09.24	New issue	5-year Green Federal note ("Green Bobl (Apr2029)")	DE000BU35025	€4.5bn
02.07.24	Tap	10-year Green Federal bond ("Green Bund (Aug2030)")	DE0001030708	€0.5bn

The Core Green Bond Team, which consists of the Federal Ministry of Finance (BMF) (Chair), the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV[3]) and the Federal Republic of Germany – Finance Agency, identified eligible expenditures of around €18.4 billion from 95 items in the 2022 federal budget. The Core Green Bond Team identified eligible expenditures of €18.8 billion from 105 items in the 2023 federal budget. The auditing firm KPMG conducted external audits of both allocations and confirmed the allocation of the issuance proceeds to the eligible expenditures (third-party verification).

[3] The names and responsibilities of the ministries correspond to the 2022 and 2023 fiscal years.

Green German Federal securities manifest their impact in various and multifaceted ways, both directly on the capital markets and indirectly through the underlying expenditures at the national and international level.

Figure 1: Goals and impacts of Green German Federal securities



Source: Federal Ministry of Finance

Capital markets

In the capital markets, Green German Federal securities directly transfer Germany's established market approach to the green segment. In this way, they offer a secure green investment with maximum price transparency and establish a green benchmark curve with a diversified maturity spectrum. With this reference curve, Germany is facilitating the general development of sustainable capital markets.

With its firm intention of maintaining and expanding the liquid green Bund curve, the Federal Republic of Germany is signalling that it will issue Green German Federal securities on a permanent and long-term basis. The eligible expenditures of the federal budget (including the Climate and Transformation Fund[4]), through which Green German Federal securities achieve their indirect effect, are needed to fulfil this objective.

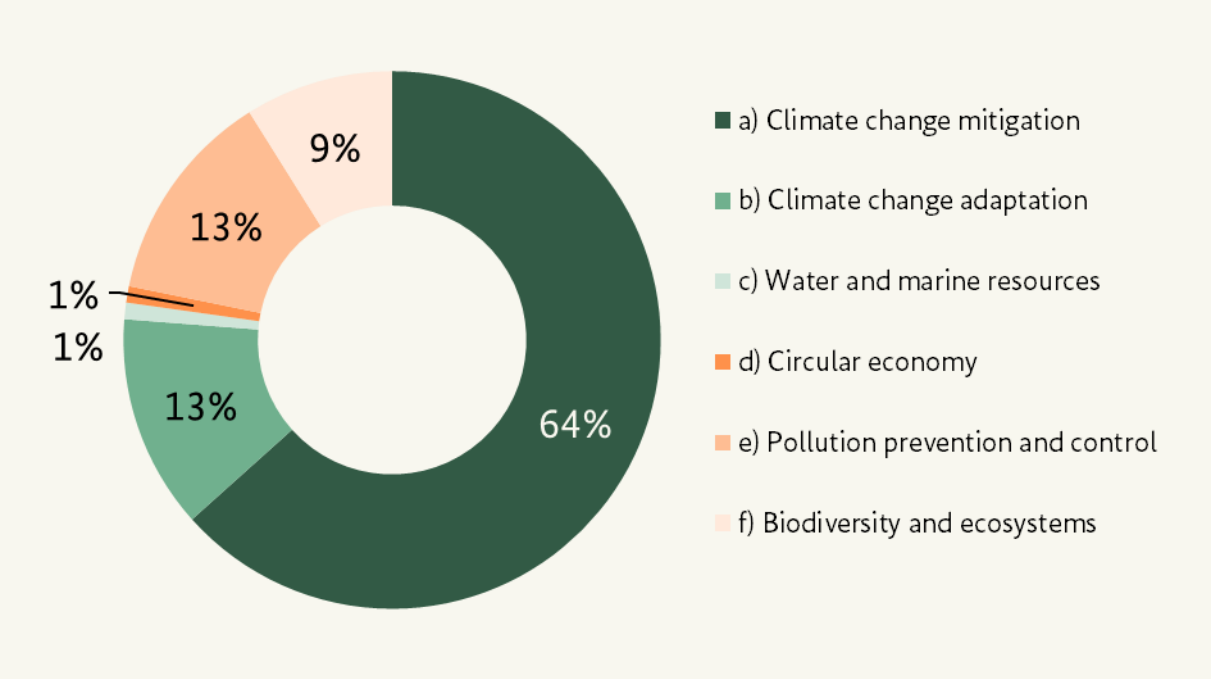
EU environmental objectives

In accordance with the Green Bond Allocation Reports for 2023 and 2024, the eligible expenditures in 2022 and 2023 are distributed among the environmental objectives of the EU taxonomy for environmentally sustainable economic activities as follows:

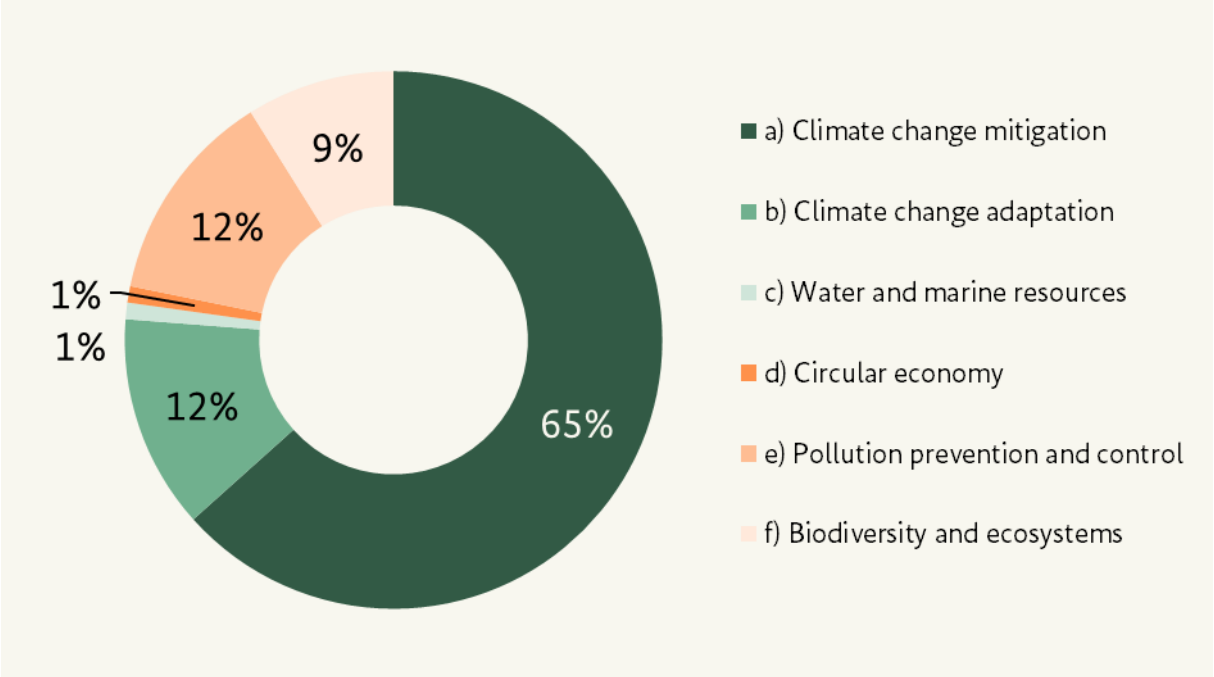
[4] With the entry into force of the Second Act Amending the Act Establishing a Special Energy and Climate Fund (*Zweites Gesetz zur Errichtung eines Sondervermögens "Energie- und Klimafonds"*) on 22 July 2022, the Special Fund was renamed "Climate and Transformation Fund" (see Federal Law Gazette I no 26 of 21 July 2022). For the purposes of the Impact Report 2023-2024, the names that were used in the fiscal years 2022 and 2023 will be used.

Figure 2: Breakdown of eligible expenditures in 2022 and 2023 in accordance with the EU's environmental objectives

2022



2023



Source: Green Bond Allocation Reports for 2023 and 2024

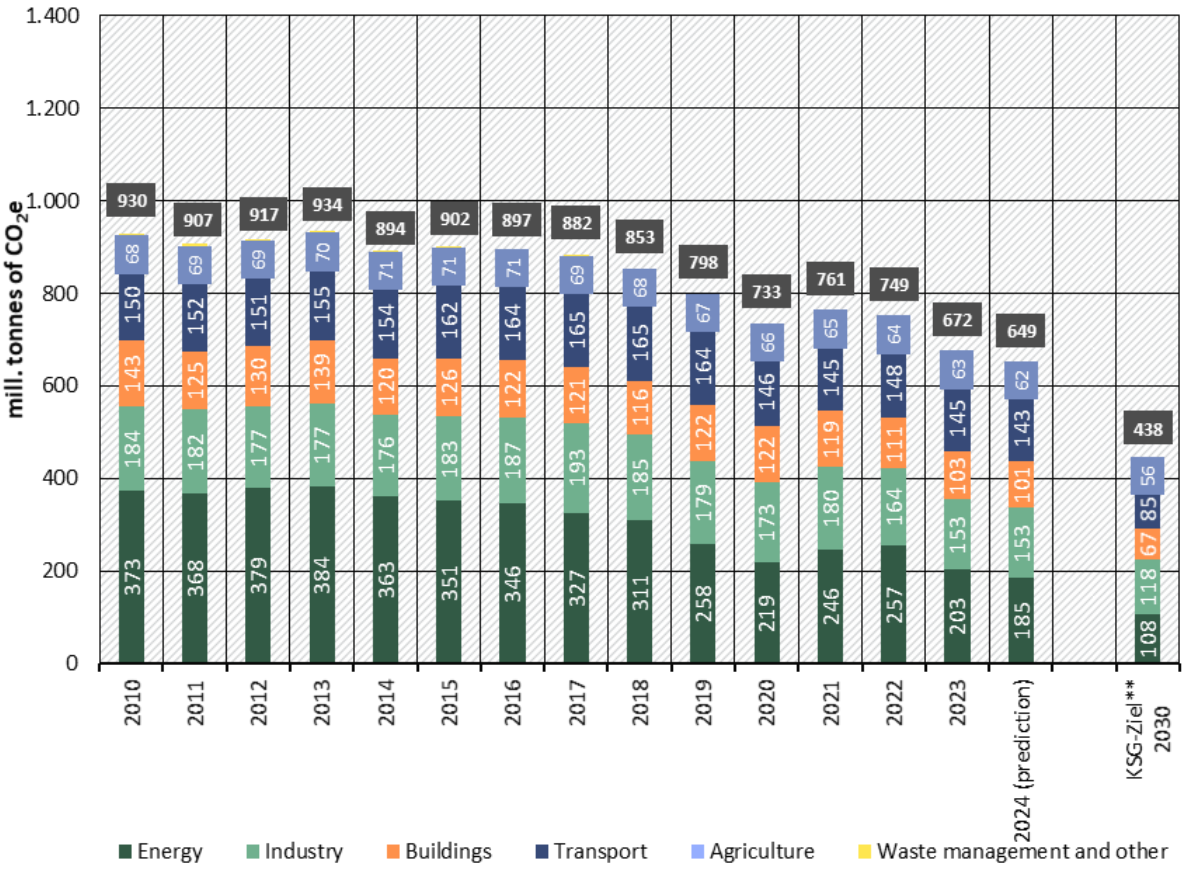
National activities

Germany is committed to the Paris Agreement and the 17 United Nations Sustainable Development Goals (SDGs). Its goal of becoming greenhouse gas neutral by 2045 was enshrined in the amended Federal Climate Action Act (*Klimaschutzgesetz*) in 2021.[5]

In 2024, about 649 million tonnes of greenhouse gases were released – about 23 million tonnes or 3.4% less than in 2023. Compared with 1990, there was a reduction of approximately 48% in greenhouse gas emissions.[6] The reduction targets are 65% for 2030 and 88% for 2040.

Figure 3: Greenhouse gas emission trends in Germany

based on the Federal Climate Action Act sectors (KSG) *



* The breakdown of the emissions deviates from the UN reporting, the total emissions are identical
** in accordance with the amendment to the Federal Climate Action Act of 12 May 2021, the years 2022-2030 adjusted to over- and undershooting of targets

Source: Federal Environment Agency, 2025

[5] https://www.bundesregierung.de/breg-de/schwerpunkte/klimaschutz/climate-change-act-2021-1936846 (text in English). In the second amendment to the Climate Action Act in 2024, the climate targets and the transparency of the emissions sectors were retained while strengthening cross-sectoral targets: https://www.bundesregierung.de/breg-de/themen/tipps-fuer-verbraucher/klimaschutzgesetz-2197410.

[6] For the Impact Report 2023-2024, the data from the Climate Action Report 2025 and the predicted greenhouse gas emissions balance 2024 is used. See https://www.umweltbundesamt.de/en/press/pressinformation/germany-on-track-for-2030-climate-targets. Detailed information on this can be found at https://dserver.bundestag.de/btd/21/012/2101250.pdf.

These goals are to be achieved through various measures: targets, incentives, financial support and investment programmes. The German climate target for 2030 also takes into account the new, more ambitious EU climate target for 2030, which all member states agreed to under the German Council Presidency at the end of 2020. Other goals in the transition to a sustainable economy include switching to renewable energy sources, using energy more efficiently, adapting to climate change and preserving biodiversity.

International cooperation

Germany plays a key role in international cooperation to promote sustainable development. In this context, Germany supports developing and emerging countries in their transition towards more environmentally sustainable economies and societies. Through its participation in international bodies, its involvement in United Nations framework conventions and its bilateral and multilateral cooperation with other states, Germany emphasises the shared responsibility of all states for a healthy planet and addresses topics in the areas of climate action and climate change, the environment, nature, biodiversity and a sustainable use of resources.

Significant contributions of eligible expenditures

The Federal Republic of Germany's Green Bond Framework[7] dated 24 August 2020 contains possible expenditure categories that contribute to environmental protection, nature conservation and climate action and that are eligible to be allocated to Green German Federal securities. They are divided among five central thematic areas (sectors):

1. Transport
2. International cooperation
3. Research, innovation and awareness-raising
4. Energy and industry
5. Agriculture, forestry, natural landscapes and biodiversity

Chapter II of this report provides conclusive information on the impacts that eligible expenditures in 2022 and 2023 (€18.4 billion and €18.8 billion respectively) had on the climate, the environment and nature, broken down by the above sectors. The following sections provide an initial summary of the manifold impacts achieved by the wide-ranging and very diversified expenditure portfolio. Aggregate figures are provided only when the various calculation approaches allow.

[7] Green Bond Framework 2020 (deutsche-finanzagentur.de)

Impact of eligible expenditures in 2022

Contributions to the reduction of greenhouse gas emissions (based on methodologies used for this report)

About 1.5 million t CO_2e p.a.
(co-financing)

In the transport sector, eligible expenditures of around €1.8 billion were used for new construction and upgrading projects in the rail sector. The rail construction and upgrading projects in the Federal Transport Infrastructure Plan 2030 that are co-financed with this funding contribute to annual emissions reductions totalling about 1.5 million tonnes of CO_2 equivalents from the time the routes are opened.

Over 2.0 million t CO_2e in 2022

The pro rata funding for track access and infrastructure facility charges provides incentives to safeguard existing rail freight transport and to shift transport to the railways. Without this funding, about 1.2 million additional tonnes of CO_2 equivalents would have been emitted in 2022. In addition, funding for combined transport and for railway sidings reduced emissions by around 0.9 million tonnes of CO_2 equivalents in 2022.

About 1.5 million t CO_2e p.a.

In the energy and industry sector, an annual reduction in greenhouse gas (GHG) emissions of about 1.5 million tonnes of CO_2 equivalents can be attributed to the programmes to promote renewable energy sources and increase energy efficiency (eligible expenditures of €445 million).

Over 20 million t CO_2e
(impact period / lifetime)

In addition, the measures to promote energy efficiency and the use of renewable energy sources in buildings and the measures of the National Climate Initiative (with expenditures of around €1.6 billion) are contributing to savings of more than 20 million tonnes of CO_2 equivalents over the entire impact period of the projects or the lifetime of the installations.

Over 8.3 million t CO_2e
(co-financing, R&D, potential after project completion)

Potential GHG reductions from co-financed research and development projects for technology transfer in the area of lightweighting are estimated at over 8.3 million tonnes of CO_2 equivalents. These reductions can potentially be realised within seven years of project completion through practical implementation in marketable products and processes.

Over 1.3 million t CO_2e
(potential reduction from shift to cycling)

It is estimated that financial assistance to the *Länder* (totalling about €130 million) for investments in cycling infrastructure can reduce emissions of CO_2 equivalents by a cumulative total of over 1.3 million tonnes by 2045 as people shift increasingly to cycling as a mode of transport.

Renewal of tracks and switches

1,980 km of track
1,787 switches

Around €4.8 billion in federal funding for investments in the rail network made a significant contribution to network maintenance. This included the renewal of 1,980 km of track and 1,787 switches (according to information from Deutsche Bahn AG).

Decarbonisation of the mobility sector

Over 1,400 research projects, 58,500 charging points and about 3,500 electric vehicles

Alternative drive systems and fuels are a key instrument for decarbonising the mobility sector. Eligible expenditures of around €443 million enabled the funding, among other things, of more than 1,400 research projects, 58,500 charging points and about 3,500 battery electric vehicles.

International support, especially for developing and emerging countries

Over 1,900 projects

In the international cooperation sector, eligible expenditures of more than €4.4 billion financed or co-financed more than 1,900 projects, for example to support developing and emerging countries in their transition to more ecologically sustainable economies and societies.

Education and innovation on climate and environmental issues

Over 5,500 projects

In the research, innovation and awareness-raising sector, eligible expenditures of around €1.5 billion include financing for more than 5,500 projects that enable and support education and innovation on climate and environmental issues.

Coastal and flood protection

Over 1,100 funding cases and about 55,000 ha protected area

In the agriculture, forestry, natural landscapes and biodiversity sector, numerous funding opportunities for coastal and flood protection are being implemented by the *Länder*. Eligible expenditures from the federal budget (around €227 million), which are co-financed by the *Länder*, contributed to coastal and flood protection covering an area of about 55,000 ha, with more than 1,100 funding cases in 2022.

Biodiversity, natural landscapes and forests

Over 5.3 million ha grant-aided area

Eligible expenditures for the conservation of nature, landscapes, forests and biodiversity were used to co-finance protected or restored areas covering a total area of over 5.3 million hectares.

Impact of eligible expenditures in 2023

Contributions to the reduction of greenhouse gas emissions (based on methodologies used for this report)

Over 1.4 million t CO_2e p.a.
(co-financing)

In the transport sector, eligible expenditures of around €1.9 billion were used for new construction and upgrading projects in the rail sector. The rail construction and upgrading projects in the Federal Transport Infrastructure Plan 2030 that are co-financed with this funding contribute to annual emissions reductions totalling over 1.4 million tonnes of CO_2 equivalents from the time the routes are opened.

Over 1.8 million t CO_2e in 2023

The pro rata funding for track access and infrastructure facility charges provides incentives to safeguard existing rail freight transport and to shift transport to the railways. Without the funding, over 1.2 million additional tonnes of CO_2 equivalents would have been emitted in 2023. In addition, funding for combined transport and for railway sidings reduced emissions by around 0.6 million tonnes of CO_2 equivalents in 2023.

Over 1.7 million t CO_2e p.a.

In the energy and industry sector, an annual reduction in greenhouse gas (GHG) emissions of over 1.7 million tonnes of CO_2 equivalents can be attributed to the programmes to promote renewable energy sources and increase energy efficiency (eligible expenditures of about €682 million).

About 11 million t CO_2e
(impact period / lifetime)

In addition, the measures to promote energy efficiency and the use of renewable energy sources in buildings and the measures of the National Climate Initiative (with expenditures of about €638 million) are contributing to savings of about 11 million tonnes of CO_2 equivalents over the entire impact period of the projects or the lifetime of the installations.

Over 13 million t CO_2e
(co-financing, R&D, potential after project completion)

Potential GHG reductions from co-financed research and development projects for technology transfer in the area of lightweighting are estimated at around 13.4 million tonnes of CO_2 equivalents. These reductions can potentially be realised within seven years of project completion through practical implementation in marketable products and processes.

About 3.1 million t CO_2e
(potential reduction from shift to cycling)

It is estimated that financial assistance to the *Länder* (totalling about €295 million) for investments in cycling infrastructure can reduce emissions of CO_2 equivalents by a cumulative total of about 3.1 million tonnes by 2045 as people shift increasingly to cycling as a mode of transport.

Renewal of tracks and switches

2,271 km of track
1,482 switches

Around €4.7 billion in federal funding for investments in the rail network made a significant contribution to network maintenance. This included the renewal of 2,271 km of track and 1,482 switches (according to information from Deutsche Bahn AG).

Decarbonisation of the mobility sector

Over 1,500 research projects, 70,500 charging points and 6,000 electric vehicles

Alternative drive systems and fuels are a key instrument for decarbonising the mobility sector. Eligible expenditures of around €612 million enabled the funding, among other things, of over 1,500 research projects, 70,500 charging points and 6,000 battery electric vehicles.

International support, especially for developing and emerging countries

About 2,000 projects

In the international cooperation sector, eligible expenditures of about €4.2 billion financed or co-financed about 2,000 projects, for example to support developing and emerging countries in their transition to more ecologically sustainable economies and societies.

Education and innovation on climate and environmental issues

Over 5,900 projects

In the research, innovation and awareness-raising sector, eligible expenditures of around €1.7 billion include financing for more than 5,900 projects that enable and support education and innovation on climate and environmental issues.

Coastal and flood protection

About 1,200 funding cases and over 400,000 ha protected area

In the agriculture, forestry, natural landscapes and biodiversity sector, numerous funding opportunities for coastal and flood protection are being implemented by the *Länder*. Eligible expenditures from the federal budget (around €214 million), which are co-financed by the *Länder*, contributed to coastal and flood protection covering an area of over 400,000 ha, with approximately 1,200 funding cases in 2023.

Biodiversity, natural landscapes and forests

About 4.1 million ha grant-aided area

Eligible expenditures for the conservation of nature, landscapes, forests and biodiversity were used to co-finance protected or restored areas covering a total area of about 4.1 million ha.

II. Impact of eligible expenditures by budget item

This chapter provides detailed reporting on each of the 95 budget items used in 2022 and each of the 105 budget items used in 2023. The budget items as well as the programmes and projects are very diverse. Therefore, a summary report at item level is supplemented by detailed examples and descriptions. The number of projects and/or funding recipients indicates the range of different funding measures. The assumptions and limitations of the reporting are presented transparently at the level of the budget items. The impacts presented are based on the current state of knowledge according to the available data and methods.

Impact indicators and metrics vary depending on expenditure type, sector, relevance, (data) availability and methodology. The impact reporting takes into account the International Capital Markets Association (ICMA) Green Bond Principles' Harmonised Framework for Impact Reporting and its core principles and recommendations.[8] The data was provided by the relevant federal ministries and is based on existing analyses and reports where possible. The distinct features of government expenditure categories, such as international cooperation grants or research and development projects, mean that the available impact indicators differ to some extent from those commonly used in the market. They therefore include all available impact dimensions (output, outcome and impact indicators).

The Core Green Bond Team coordinated the preparation of this report. The Impact Report was validated by the Interministerial Working Group. The names and responsibilities of the ministries correspond to the 2022 and 2023 fiscal years.[9]

a) Tabular overview of the key indicators

The following tables provide an overview of key figures for eligible expenditures that are of particular importance for the corresponding sector or budget item. The expenditures are listed according to subsectors within a specific sector. The values given are rounded in the standard manner. Indicators, examples and detailed information (such as assumptions and limitations) for each budget item are provided in the fact sheets in section b), which directly follows the tabular overview. For ease of navigation, the subsector names in the table are linked to the corresponding pages in the report.

[8] https://www.icmagroup.org/assets/documents/Sustainable-finance/2024-updates/Handbook-Harmonised-Framework-for-Impact-Reporting-June-2024.pdf

[9] Official order according to the announcement of the formation of the government on 8 December 2021 in the Federal Gazette of 10 December 2021.

Subsector	Eligible expenditures in 2022 (in € million)	Allocation to securities in 2023 (in € million)				Selected impact indicators
		Green Bobl (Oct. 2025)	Green Bobl (Oct. 2027)	Green Bund (Feb. 2033)	Green Bund (Aug. 2053)	
1. Transport sector						
1.1. Rail transport	7,259.5	988.0	1,185.6	2,470.1	2,173.7	1.462 million t CO_2e p.a. GHG reduction 2.009 million t CO_2e GHG reduction 2,712 t No_x reduction p.a. 13 t reduction of particulate matter 1980 km track, 1,787 switches, 18,762 m^3 bridges 92 km noise-reduced route, 38 km noise barriers
1.2. Alternative drive systems and fuels	442.5	60.2	72.3	150.6	132.5	1.270 million t CO_2e GHG reduction 3,499 funded vehicles 58,547 funded charging points 1,409 projects 13 beneficiaries
1.3. Public transport	975.4	132.8	159.3	331.9	292.1	330 projects
1.4. Cycling	253.7	34.5	41.4	86.3	76.0	1.345 million t CO_2e potential GHG reduction 154 km of newly built cycle paths 2,011 measures
2. International cooperation sector						
2.1. Bilateral financial cooperation	1,323.9	180.2	216.2	450.5	396.4	542 projects
2.2. Bilateral technical cooperation	828.9	112.8	135.4	282.0	248.2	708 projects
2.3. International climate and environmental protection	763.7	103.9	124.7	259.9	228.7	550 projects
2.4. Multilateral cooperation	804.4	109.5	131.4	273.7	240.9	13 supported international initiatives 32 funded institutions

Subsector	Eligible expenditures in 2022 (in € million)	Allocation to securities in 2023 (in € million)				Selected impact indicators
		Green Bobl (Oct. 2025)	Green Bobl (Oct. 2027)	Green Bund (Feb. 2033)	Green Bund (Aug. 2053)	
2.5. Specific funding	721.2	98.2	117.8	245.4	215.9	3,515 t CO_2e GHG reduction 142 projects
3. Research, innovation and awareness-raising sector						
3.1. Research for sustainability	609.4	82.9	99.5	207.4	182.5	3,330 projects 3,056 beneficiaries 34 expert panels, professional conferences and status seminars
3.2. Environmental protection, nature conservation and climate change adaptation	128.3	17.5	21.0	43.7	38.4	756 projects
3.3. Aerospace, energy, transport and digitalisation	734.0	99.9	119.9	249.7	219.8	1,210 projects 193 beneficiaries 14 events with about 1,300 participants 2,307 (scientific) publications
3.4. Lightweight and other construction solutions	62.3	8.5	10.2	21.2	18.7	8.320 million t CO_2e potential GHG reduction 306 projects
4. Energy and industry sector						
4.1. Energy research	564.5	76.8	92.2	192.1	169.0	5,029 projects
4.2. Renewable energy	1,396.6	190.1	228.1	475.2	418.2	14.603 million t CO_2e GHG reduction 86,700 funded projects 30 shore-to-ship power systems under construction
4.3 Energy efficiency	563.6	76.7	92.0	191.8	168.8	1.49 million t CO_2e p.a. GHG emissions avoided 4.617 million MWh p.a. end-use energy savings 368 new approvals to local authorities 421,717 beneficiaries

Subsector	Eligible expenditures in 2022 (in € million)	Allocation to securities in 2023 (in € million)				Selected impact indicators
		Green Bobl (Oct. 2025)	Green Bobl (Oct. 2027)	Green Bund (Feb. 2033)	Green Bund (Aug. 2053)	
4.4 National climate action measures	218.8	29.8	35.7	74.4	65.5	5.71 million t CO_2e GHG reduction over the entire impact period
5. Agriculture, forestry, natural landscapes and biodiversity sector 						
5.1 Agriculture	69.2	9.4	11.3	23.5	20.7	0.023 million t CO_2e GHG reduction 1,014 subprojects 1,113 beneficiaries
5.2. Land use, land-use change and forestry (LULUCF)	201.8	27.5	33.0	68.7	60.4	1,360 projects 550 beneficiaries 60,946 funding cases 45,135 ha grant-aided area 8,990 ha reforested area, 154 ha initial afforestation
5.3. Biodiversity and natural landscapes	219.8	29.9	35.9	74.8	65.8	308,391 funding cases, projects and measures 5.332million ha grant-aided area 560,359 grant-aided trees
5.4. Coastal and flood protection	227.1	30.9	37.1	77.3	68.0	1,143 funding cases 54,657 ha grant-aided area 2,105 ha reclaimed floodplain area 3,114 ha near-natural water body development

Subsector	Eligible expenditures in 2023 (in € million)	Allocation to securities in 2024 (in € million)							Selected impact indicators
		Green Bobl (Oct. 25)	Green Bobl (Oct. 27)	Green Bobl (Apr. 29)	Green Bund (Aug. 30)	Green Bund (Feb. 33)	Green Bund (Aug. 50)	Green Bund (Aug. 53)	
1. Transport sector									
1.1. Rail transport	7,347.3	390.4	390.4	1,757.0	195.2	1,464.2	1,073.7	1,561.8	1.439 million t CO_2e p.a. GHG reduction 1.824 million t CO_2e GHG reduction 2,497 t No_x reduction p.a. 11 t reduction of particulate matter 2,271 km track, 1,482 switches, 30.099 m^3 bridges 54 km noise-reduced route, 47 km noise barriers
1.2. Alternative drive systems and fuels	612.3	32.5	32.5	146.4	16.3	122.0	89.5	130.2	1.366 million t CO_2e GHG reduction 6,050 funded vehicles, 70,536 funded charging points 1,540 projects, 10 beneficiaries
1.3. Public transport	1,160.3	61.7	61.7	277.5	30.8	231.2	169.6	246.6	358 projects
1.4. Cycling	424.0	22.5	22.5	101.4	11.3	84.5	62.0	90.1	3.073 million t CO_2e potential GHG reduction 120 km of newly built cycle paths 2,509 measures
2. International cooperation sector									
2.1. Bilateral financial cooperation	1,235.1	65.6	65.6	295.4	32.8	246.1	180.5	262.5	568 projects
2.2. Bilateral technical cooperation	861.6	45.8	45.8	206.0	22.9	171.7	125.9	183.1	735 projects
2.3. International climate and	804.2	42.7	42.7	192.3	21.4	160.3	117.5	170.9	508 projects

Subsector	Eligible expenditures in 2023 (in € million)	Allocation to securities in 2024 (in € million)							Selected impact indicators
		Green Bobl (Oct. 25)	Green Bobl (Oct. 27)	Green Bobl (Apr. 29)	Green Bund (Aug. 30)	Green Bund (Feb. 33)	Green Bund (Aug. 50)	Green Bund (Aug. 53)	
environmental protection									
2.4. Multilateral cooperation	853.5	45.4	45.4	204.1	22.7	170.1	124.7	181.4	16 supported international initiatives 32 funded institutions
2.5. Specific funding	406.6	21.6	21.6	97.2	10.8	81.0	59.4	86.4	199 t CO_2e GHG reduction 169 projects
3. Research, innovation and awareness-raising sector									
3.1. Research for sustainability	550.5	29.3	29.3	131.6	14.6	109.7	80.4	117.0	3,349 projects, 2,884 beneficiaries 38 expert panels, professional conferences and status seminars
3.2. Environmental protection, nature conservation and climate change adaptation	136.5	7.3	7.3	32.6	3.6	27.2	19.9	29.0	740 projects
3.3. Aerospace, energy, transport and digitalisation	902.4	48.0	48.0	215.8	24.0	179.8	131.9	191.8	1,525 projects 323 beneficiaries 26 events (approximately 1,600 participants) 2,261 publications
3.4. Lightweight and other construction solutions	89.9	4.8	4.8	21.5	2.4	17.9	13.1	19.1	13.36 million t CO_2e potential GHG reduction 358 projects
4. Energy and industry sector									
4.1. Energy research	557.1	29.6	29.6	133.2	14.8	111.0	81.4	118.4	5,193 projects

Subsector	Eligible expenditures in 2023 (in € million)	Allocation to securities in 2024 (in € million)							Selected impact indicators
		Green Bobl (Oct. 25)	Green Bobl (Oct. 27)	Green Bobl (Apr. 29)	Green Bund (Aug. 30)	Green Bund (Feb. 33)	Green Bund (Aug. 50)	Green Bund (Aug. 53)	
4.2. Renewable energy	816.8	43.4	43.4	195.3	21.7	162.8	119.4	173.6	3.71 million t CO_2e GHG reduction 15,500 funded projects 19 shore-to-ship power systems under construction
4.3. Energy efficiency	851.7	45.3	45.3	203.7	22.6	169.7	124.5	181.0	1.73 million t CO_2e p.a. GHG reduction 5.173 million MWh p.a. end-use energy savings 327 new approvals to local authorities 394,594 beneficiaries
4.4. National climate action measures	298.5	15.9	15.9	71.4	7.9	59.5	43.6	63.5	6.92 million t CO_2e GHG reduction over the entire impact period
5. Agriculture, forestry, natural landscapes and biodiversity sector									
5.1. Agriculture	90.2	4.8	4.8	21.6	2.4	18.0	13.2	19.2	0.036 million t CO_2e GHG reduction 1,084 subprojects and projects 1,663 beneficiaries
5.2. Land use, land-use change and forestry (LULUCF)	311.5	16.6	16.6	74.5	8.3	62.1	45.5	66.2	1,439 projects 9,268 beneficiaries 59,082 funding cases, 1.591 million ha grant-aided area 8,340 ha reforested area, 155 ha initialaf forestation
5.3. Biodiversity and natural landscapes	294.1	15.6	15.6	70.3	7.8	58.6	43.0	62.5	328,289 funding cases, projects and measures 4,074 million ha grant-aided area 419,759 grant-aided trees
5.4. Coastal and flood protection	213.6	11.4	11.4	51.1	5.7	42.6	31.2	45.4	1,182 funding cases, 407,869 ha grant-aided area 2,855 ha reclaimed floodplain area 3,914 ha near-natural water body development

b) Fact sheets

The following fact sheets provide detailed information regarding impacts on the climate, the environment and nature for each budget item used. For ease of navigation, there is a link to the tabular overview (section a) at the end of each fact sheet.

The primary objective of the Federal Climate Action Act is to reduce greenhouse gas emissions. Where available, CO_2 reduction is therefore reported as a key indicator.[10] For the other goals in the transition to a sustainable economy – including the shift to renewable energy, more efficient energy use, climate change adaptation and biodiversity preservation – available indicators are reported accordingly. The EU environmental objectives pursued with the expenditures are listed in each fact sheet.[11] The UN Sustainable Development Goals (SDGs) assigned to each of the five sectors are shown at the beginning of the sector chapters.

Current developments and forecasts of greenhouse gas emissions are published in the federal government's annual Climate Action Report and the German greenhouse gas inventory.[12] According to these sources, about 649 million tonnes of CO_2 equivalents were released in 2024 – about 23 million tonnes or 3.4% less than in 2023.

[10] For consistent reporting (paragraph 13 of the ICMA Green Bond Principles' Harmonised Framework for Impact Reporting), reporting is uniformly in CO_2 equivalents. CO_2 figures are reported as CO_2 equivalents in accordance with the prudence principle.

[11] In the order they are listed in Article 9 of the EU Taxonomy Regulation: a) climate change mitigation, b) climate change adaptation, c) water and marine resources, d) circular economy, e) pollution prevention and control and f) biodiversity and ecosystems.

[12] Pursuant to section 10 (1) of the Federal Climate Action Act, the federal government's Climate Action Report analyses trends in greenhouse gas emissions in the various sectors, describes the implementation status of climate programmes and immediate action programmes, and provides a forecast of the expected greenhouse gas reduction effect. The Climate Action Report is prepared annually by the federal government for the respective previous year. The predicted greenhouse gas emissions balance of 2024 is published by the Federal Environment Agency at https://www.umweltbundesamt.de/en/press/pressinformation/germany-on-track-for-2030-climate-targets. The publication of the final balance will be published in January 2026.

1. Transport

The transport sector emits around 22% of Germany's greenhouse gases, with road transport accounting for the bulk of transport emissions.[13] The transport sector must therefore make a significant contribution if Germany is to meet its climate targets. In addition, the federal government has set itself the goal of reducing air pollutants that are harmful to health and the environment, such as nitrogen oxides.[14] Accordingly, it has adopted extensive measures to, among other things, decarbonise passenger and freight transport and make it more climate-friendly.

According to the predicted greenhouse gas emissions balance, around 143 million tonnes of CO_2 equivalents were emitted in the transport sector in 2024.[15] This is a modest year-on-year decline of 1.4%.

The transport sector's eligible expenditures in 2022 amounted to €8,931.1 million and were distributed across 24 budget items. The sector's eligible expenditures in 2023 amounted to €9,543.9 million and were distributed across 26 budget items. For both years, the budget items can be assigned to the following subsectors:

	2022		2023	
Subsector	**Eligible expenditures (in € million)**	**Number of budget items**	**Eligible expenditures (in € million)**	**Number of budget items**
Rail transport	7,259.5	9	7,347.3	9
Alternative drive systems and fuels	442.5	5	612.3	6
Public transport	975.4	3	1,160.3	4
Cycling	253.7	7	424.0	7

[13] The German government's 2025 Climate Action Report: https://dserver.bundestag.de/btd/21/012/2101250.pdf
[14] See the Federal Pollution Control Act (*Bundes-Immissionsschutzgesetz*) and the related ordinance (*Bundes-Immissionsschutzverordnung*).

[15] See p. 21 of the Climate Action Report 2025 and the predicted greenhouse gas emissions balance published by the Federal Environment Agency at https://www.umweltbundesamt.de/en/press/pressinformation/germany-on-track-for-2030-climate-targets.

1.1. Rail transport

1.1.1. Construction cost subsidies for investments in the expansion of the federal rail infrastructure

	2022	2023
Budget chapter and item:	1202 891 01	
Eligible expenditures:	€1,790.0 million	€1,902.0 million
GHG emission reduction:	1.462 million t CO_2e p.a.	1.439 million t CO_2e p.a.
NO_x emission reduction:	2,712 t NO_x p.a.	2,497 t NO_x p.a.
Particulate matter (PM) emission reduction:	13 t PM p.a.	11 t PM p.a.
Funding share:	1.36%	1.62%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) e) f)	

Assumptions and limitations: The annual GHG emission reduction represents the annual GHG reduction share after route opening. Recording of the CO_2 reduction was not part of the project assessment for the 2003 Federal Transport Infrastructure Plan (FTIP); this data was recorded only for projects in the 2030 FTIP, i.e. a CO_2 reduction estimate is available only for some of the projects. The actual CO_2 reduction is therefore greater than indicated here. The stated funding shares of 1.36% in 2022 and 1.62% in 2023 were determined on the basis of the data provided in the Transport Investment Reports for 2022 and 2023 (for both years, expenditures as a ratio of total investments by projects for which a GHG reduction estimate is available).

Links:
https://bmdv.bund.de/SharedDocs/DE/Artikel/G/BVWP/bundesverkehrswegeplan-2030-inhalte-herunterladen.html
Methodology: https://bmdv.bund.de/SharedDocs/DE/Anlage/G/BVWP/bvwp-methodenhandbuch.pdf?__blob=publicationFile
Project details: https://www.bvwp-projekte.de/map_railroad_2018.html

The federal government provides investment subsidies for the construction and expansion of rail projects specified in the federal railway requirement plan (Annex to section 1 of the Federal Railways Expansion Act (*Bundesschienenwegeausbaugesetz*)). The 2030 Federal Transport Infrastructure Plan is the most important transport infrastructure planning tool. Further details on the projects, including the size of the CO_2 reduction in each case, are available at: https://www.bvwp-projekte.de/map_railroad_2018.html.

The following indicators can be reported for the largest projects (basis: 2022 and 2023 expenditures as cited in the Transport Investment Reports for 2022 and 2023, respectively; annual emission reduction from route opening):

Project	GHG emissions reduction (in t CO_2e p.a.)	NO_x emissions reduction (in t p.a.)	Particulate matter (PM) reduction (in t p.a.)
ABS/NBS Karlsruhe - Basel	189,701	67	-2
ABS/NBS Nuremberg - Erfurt (VDE 8.1)	29,862	37	0
Major hubs (Frankfurt, Hamburg, Cologne, Mannheim, Munich, Hanover)	282,626	190	1
Rhein-Ruhr-Express (RRX): Cologne – Düsseldorf – Dortmund/Münster	16,151	66	-1
ABS/NBS Hamburg – Lübeck – Puttgarden (Fehmarn Belt tunnel hinterland link)	66,664	270	1
ABS/NBS Hanau-Würzburg/Fulda-Erfurt	42,180	48	0
ABS Angermünde – German/Polish border (Szczecin)	15,602	31	0
ABS Munich - Mühldorf - Freilassing	23,091	285	1

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1.1.2. Construction cost subsidies for investments in the federal rail infrastructure to address bottlenecks in public transport networks

	2022	2023
Budget chapter and item:	1202 891 02	
Eligible expenditures:	€57.9 million	€14.7 million
GHG emission reduction:	Not available	Not available
Projects:	1	1
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b)	e) f)

Assumptions and limitations: The "Weddeler Schleife" project also receives funding from budget item 1206 891 01 and is therefore also covered in the fact sheet for that budget item.

Links: --

For this budget item, only the following project receives co-financing from budget item 1206 891 01 ("Investment subsidies for major public transport projects to Deutsche Bahn AG and companies majority-owned by the Federal Government", see also 1.3.2):

Community Transport Financing Act (*Gemeindeverkehrsfinanzierungsgesetz*) project number BMDV: 03 D 514_A: "Weddeler Schleife double-tracking" (see 2.2.2).

The "Weddeler Schleife" (Deutsche Bahn route number 1956) is a railway connection between the cities of Braunschweig and Wolfsburg. The mostly one-track route runs between the Weddel and Fallersleben stations and is approximately 20 km in length. It is used for purposes of local passenger transport, long-distance passenger transport and freight transport.

In order to meet the growing transport demand, the authority responsible for local rail passenger transport in the region is planning to expand services on this route so that trains run all day at 30-minute intervals rather than the current hourly intervals. In order to ensure adequate capacity and operational quality, the entire route will have to be double-tracked. Double-tracking will help to ensure that timetables remain reliable and will create additional capacity not only for local rail passenger transport but also for long-distance rail passenger transport and rail freight transport. This will significantly enhance the attractiveness of local rail transport, thereby facilitating a shift of traffic from road to rail. As shown above, co-financing for this project was secured from budget item 1202 891 02 for the years 2022 and 2023.

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1.1.3. Measures to reduce noise pollution from existing federal railways

	2022	2023
Budget chapter and item:	1202 891 05	
Eligible expenditures:	€129.9 million	€150.3 million
GHG emission reduction:	Pursues other objectives	Pursues other objectives
Noise-reduced route:	92 km	54 km
Erected noise barriers:	38 km	47 km
Housing units eligible for funding:	19,793	9,912
Number of persons benefiting from noise reduction:	41,565	20,815
Funding share:	Not available	Not available
EU environmental objectives under Article 9Article 9 of the Taxonomy Regulation:	 e)	
Assumptions and limitations: --		
Links: https://bmdv.bund.de/SharedDocs/DE/Artikel/E/schiene-laerm-umwelt-klimaschutz/laermvorsorge-und-laermsanierung.html		

Achieving the targets for shifting traffic to the railways depends on whether the necessary public acceptance can be gained. For decades, extensive work has been done to improve noise protection on and along the railways. Noise reduction measures are carried out on existing lines affected by rail noise. Technological progress and innovative developments help in this process. The federal government provides annual funding for the programme “Measures to reduce noise pollution from existing federal railways” (*Maßnahmen zur Lärmsanierung an bestehenden Schienenwegen der Eisenbahnen des Bundes*). The funding is provided for buildings constructed before 1 January 2015. The same applies to residential buildings constructed on land that was designated for residential use before 1 January 2015.

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1.1.4. Construction cost subsidies for maintaining the federal rail infrastructure

	2022	2023
Budget chapter and item:	1202 891 11	
Eligible expenditures:	€4,776.7 million	€4,714.6 million
GHG emission reduction:	Not available	Not available
Tracks:	1,980 km	2,271 km
Switches:	1,787	1,482
Bridges:	18,762 m^3	30,099 m^3
Funding share:	61.7%	49.5%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b)	e) f)

Assumptions and limitations: The impact data refers to the total investment amounts of €7,745 million (in 2022) and €9,532 million (in 2023), i.e. including construction cost subsidies from third parties, other financing from the federal government (among other things, to compensate for dividends payable) and own funding provided by Deutsche Bahn AG. Eligible expenditures accounted for 61.7% of the total investment amount in 2022. Eligible expenditures accounted for 49.5% of the total investment amount in 2023.

Links:
Data (on additional indicators) as provided in the 2022 Infrastructure Status and Development Report (*Infrastrukturzustands- und -entwicklungsbericht*, or IZB), on pages 42 et seq., 175 et seq. and 238 et seq.: https://www.eba.bund.de/SharedDocs/Downloads/DE/Finanzierung/IZB/IZB_2022.html?nn=1525292
Data (on additional indicators) as provided in the 2023 Infrastructure Status and Development Report, on pages 40 et seq., 141 et seq. and 205 et seq.: https://www.eba.bund.de/SharedDocs/Downloads/DE/Finanzierung/IZB/IZB_2023.html?nn=1525292

In Germany, rail transport and its related infrastructure play a central role in facilitating the achievement of national climate targets. In light of the urgent challenges posed by climate change, it is imperative to shift traffic from road to rail. This shift not only contributes to the reduction of CO_2 emissions but also helps to ensure more sustainable mobility. Another key priority is to expand the electrification of tracks and transport systems, which plays a decisive role in the decarbonisation of the transport sector.

As part of the third Performance and Financing Agreement (*Leistungs- und Finanzierungsvereinbarung*), the federal government has made funds available for the purpose of (a) implementing maintenance measures and (b) making replacement investments in federal rail infrastructure. These needs-based investments aim to ensure that infrastructure can handle growing demands on the rail system.

Under the Third Performance and Financing Agreement, federal rail infrastructure companies are contractually obliged to meet specific quality standards for infrastructure. This includes regular inspections of and reporting on the current condition of existing infrastructure, in order to ensure transparency and accountability.

The 2022 and 2023 Infrastructure Status and Development Reports (*Infrastrukturzustands- und -entwicklungsbericht*, or IZB) are useful tools for infrastructure assessments. These reports are prepared by Deutsche Bahn AG and reviewed by the Federal Railway Authority. They provide a comprehensive analysis of current rail network conditions, including relevant quality indicators and

examples of key investments. This information is crucial for documenting progress in the development and maintenance of rail infrastructure and for planning future measures to improve the performance and reliability of rail transport.

Overall, it has been found that investing in rail infrastructure not only plays a key role in helping to achieve climate targets but also promotes more climate-friendly and efficient mobility in Germany (see the above link). Detailed information on the selected impact indicators (together with examples of investments) is provided on the following pages in the IZBs for 2022 and 2023:

IZB 2022:

Tracks: pp. 45-47; switches: pp. 47-48; bridges: pp. 48-50. In addition, the respective investment reports of DB Netz AG (pp. 41 et seq.), DB Station&Service AG (pp. 174 et seq.) and DB Energie GmbH (pp. 238 et seq.) included in the IZB describe numerous other investments in greater detail.

IZB 2023:

Tracks: pp. 44-46; switches: pp. 46-47; bridges: pp. 48-50. In addition, the respective investment reports of DB Netz AG (pp. 38 et seq.), DB Station&Service AG (pp. 140 et seq.) and DB Energie GmbH (pp. 205 et seq.) included in the IZB describe numerous other investments in greater detail.

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1.1.5. Reduction of infrastructure facility charges in rail freight transport

	2022	2023
Budget chapter and item:	1210 682 51	
Eligible expenditures:	€37.1 million	€84.3 million
GHG emission reduction:	0.071 million t CO_2e	0.161 million t CO_2e
Beneficiaries:	18	17
Funding share:	42.5%	88.4%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) e) f)	

Assumptions and limitations: The 2024 evaluation (for the 2021-2023 evaluation period) found that CO_2e emissions had been reduced by 379,400 tonnes, with eligible expenditures totalling €197.5 million. Due to the funding programme's design, it is not possible to make a precise breakdown of GHG emissions reductions by project or by year. Computed on the basis of mathematical averages, eligible expenditures of €37.1 million in 2022 correspond to CO_2e emissions reductions of 71,270 tonnes, and eligible expenditures of €84.3 million in 2023 correspond to CO_2e emissions reductions of 161,941 tonnes.

By 15 October 2023, a total of 88 funding applications had been submitted (29 for the 2020-21 working timetable period, 19 for the 2021-22 working timetable period, 17 for the 2022-23 working timetable period, and 23 for the 2023-24 working timetable period).

Funding shares are computed and published per working timetable period and vary according to the amount of available funding and the type of transport. Working timetable periods begin in mid-December. Computed on the basis of mathematical averages, this means that the funding share was 42.5% in 2022 and 88.4% in 2023 (the funding shares for the corresponding working timetable periods, i.e. from mid-December to mid-December, were 40.4% in 2021-22, 91.4% in 2022-23 and 18.3% in 2023-2024).

Links:
https://bmdv.bund.de/SharedDocs/DE/Artikel/E/schiene-schienengueterverkehr/anlagenpreisfoerderung-im-schienenverkehr.html
https://www.eba.bund.de/DE/Themen/Finanzierung/APF/apf_node.html

Pro rata funding for infrastructure facility charges in rail freight transport (with a focus on wagonload freight) is provided as part of the Climate Action Programme 2030. Specifically, the federal government finances part of the service facility usage charges (net of value added tax) that are charged by rail freight transport service facility operators (particularly for wagonload freight) on the basis of charge schedules that are published together with the applicable Terms of Use for Service Facilities (*Nutzungsbedingungen für Serviceeinrichtungen*).

Funding is available for the use of marshalling yards and train formation facilities, including shunting facilities. The funding provides a significant incentive to make rail freight transport more competitive relative to road freight transport and, in furtherance of the Climate Action Programme 2030, to stabilise or increase the rail traffic volume in Germany, particularly in wagonload freight.

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1.1.6. Reduction of track access charges in rail freight transport

	2022	2023
Budget chapter and item:	1210 682 52	
Eligible expenditures:	€380.4 million	€374.2 million
GHG emission reduction:	1.08 million t CO_2e	1.06 million t CO_2e
Beneficiaries:	195	194
Operational performance in train-kilometres (trkm):	251,562,450	242,609,725
Funding share:	Variable, between 44.9% and 56%	Variable, between 19.5% and 61.4%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b)	e)

Assumptions and limitations: Model calculations from the evaluation conducted in 2021 (link: https://bmdv.bund.de/SharedDocs/DE/Artikel/E/schiene-schienengueterverkehr/trassenpreisfoerderung.html) show that without the funding, 2.4 million tonnes more CO_2 would have been emitted during the 2.5 years of the funding period from 1 July 2018 to 31 December 2020. The evaluation does not cover funding provided in 2022 and 2023. However, as no other suitable data is available to determine impacts, the impacts for 2022 and 2023 are approximated based on the ratio of funding provided in 2022 and 2023 (respectively) to the funding provided during the funding period covered by the evaluation (see pp. 70 et seq. of the evaluation in the above link).

Links:
https://bmdv.bund.de/SharedDocs/DE/Anlage/E/eval_traf%C3%B6g_endbericht.pdf?__blob=publicationFile

The pro rata funding for track access charges in rail freight transport creates a significant incentive to (a) keep existing rail freight transport volumes on the railways and (b) shift freight transport from road to rail. To this end, federal budget funding is made available via DB InfraGO AG (which was known as "DB Netz AG" in 2022 and 2023) to companies operating in the area of rail freight transport. Funding is available for all transport operations that serve the national or cross-border carriage of goods within the scope of DB InfraGO AG's system of track access charges. Funding is provided to cover part of DB InfraGO AG's track access charges, which are levied on a per kilometre basis. Measurement runs, construction machinery transports and breakdown trains are excluded from the funding. Funding is based on the track access charge net of value added tax. Companies that receive funding in excess of €500,000 are published in accordance with section 6 (5) of the funding guidelines for the 2022 working timetable period (for 2022, see https://www.eba.bund.de/SharedDocs/Downloads/DE/Finanzierung/Foerderung_anteiliger_Trassenentgelte/41_Bekannntgabe_Beihilfe_2022.pdf?__blob=publicationFile&v=3; for 2023, see https://www.eba.bund.de/SharedDocs/Downloads/DE/Finanzierung/Foerderung_anteiliger_Trassenentgelte/41_Bekannntgabe_Beihilfe_2023.pdf?__blob=publicationFile&v=2).

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1.1.7. Construction cost subsidies for investments in the non-federal rail infrastructure

	2022	2023
Budget chapter and item:	1210 891 51	
Eligible expenditures:	€23.2 million	€30.4 million
GHG emission reduction:	Not available	Not available
Projects:	54	83
Funding share:	Maximum 50%	Maximum 50%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b)	e) f)

Assumptions and limitations: --

Links:
https://www.eba.bund.de/DE/Themen/Finanzierung/Foerderung_SGFFG/foerderung_sgffg_node.html

In the Long-Distance Rail Freight Network Funding Act (*Schienengüterfernverkehrsnetzförderungsgesetz*) of 7 August 2013[16], the federal government created the legal basis for funding the upgrading and maintenance of non-federal public rail infrastructure serving long-distance rail freight and not exclusively local rail freight and/or passenger rail transport. Up to a maximum amount of 50% of investment spending on the replacement of non-federal public rail infrastructure is financed by the federal government (contingent upon the availability of federal budget funds) in the form of non-repayable construction cost subsidies. The costs of maintaining and repairing the relevant rail infrastructure are borne by the non-federal public railways.

Eligible expenditures provided (partial) funding for 54 projects in 2022 and for 83 projects in 2023. The bulk of this funding (about 70% in 2022 and about 79% in 2023) was allocated for replacement investments in superstructure renewal (i.e. renewal of tracks, sleepers and switches, including related measures). In addition, some of the funding (about 20% in 2022 and about 10% in 2023) was invested in the adaptation of control and safety systems (such as the partial renewal of signal boxes). In both years, about 5% was used for measures to upgrade level crossings (e.g. bringing barrier opening and closing systems up to the latest standards and renovating track base plates) and for bridge/culvert renovation.

The aim of the funded projects is the renewal/adaptation of existing, outdated rail infrastructure in order to maintain the future viability of long-distance rail freight transport and to prevent line closures that might occur if outdated infrastructure were to cause freight transport to shift from rail to road. The measures consist of replacement investments using up-to-date technology.

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[16] https://www.gesetze-im-internet.de/sgffg/BJNR311510013.html

1.1.8. Subsidies to private companies for investments in combined transport

	2022	2023
Budget chapter and item:	1210 892 41	
Eligible expenditures:	€43.8 million	€65.3 million
GHG emission reduction:	0.129 million t CO_2e	0.194 million t CO_2e
Freight transport performance:	1.8 billion tkm	2.68 billion tkm
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: Source: Report on the evaluation of the "Guidelines on the promotion of transshipment facilities for combined transport by non-federally owned companies" (*Richtlinie zur Förderung von Umschlaganlagen des Kombinierten Verkehrs nicht bundeseigener Unternehmen*). The relief effect of 40.95 tkm per euro of funding used, on which the calculation is based, is an average figure calculated from the relief effect due to the additional transshipment volume of all CT terminals funded in the period 1998-2019. It is not possible to calculate the relief effect on the basis of the funding measures implemented in 2022 and 2023.

Links:
https://bmdv.bund.de/SharedDocs/DE/Artikel/G/Umschlaganlagen-foerderrichtlinie.html

In order to shift more freight transport from road to rail and inland waterways, the federal government provides funding for investment in combined transport (CT) transshipment facilities owned by private-sector companies. The promotion of combined transport increases CT transshipment volumes and thus also helps to reduce road traffic.

For the year 2022, the additional transshipment volume resulting from the funding for CT terminals used in 2022 is estimated to have reduced freight transport by 1.80 billion tkm. This reduction can be broken down into 1.47 billion tkm for road-rail CT and 0.33 billion tkm for inland waterway-road CT. Assuming that, per tkm, 73.7 g CO_2e are avoided with road-rail CT and 61.9 g CO_2e are avoided with inland waterway-road CT, a total savings of 0.129 million tonnes of CO_2e was achieved in 2022 through use of the funded CT terminals.

For the year 2023, the additional transshipment volume resulting from the funding for CT terminals used in 2023 is estimated to have reduced freight transport by 2.68 billion tkm in total. This reduction can be broken down into 2.40 billion tkm for road-rail CT and 0.28 billion tkm for inland waterway-road CT. Assuming that, per tkm, 73.7 g CO_2e are avoided with road-rail CT and 61.9 g CO_2e are avoided with inland waterway-road CT, a total savings of 0.194 million tonnes of CO_2e was achieved in 2023 through use of the funded CT terminals.

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1.1.9. Investment subsidies to private companies to fund the construction, expansion, reactivation and replacement of sidings and other rail freight facilities

	2022	2023
Budget chapter and item:	1210 892 42	
Eligible expenditures:	€20.5 million	€11.5 million
GHG emission reduction:	0.729 million t CO_2e	0.409 million t CO_2e
Funding share:	See below	See below
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) e) f)	

Assumptions and limitations: On the basis of an evaluation, CO_2e emissions were reduced by 35,600 tonnes per €1 million in funding.

Funding share:

The impact indicator refers to the full amount of eligible expenditures (100%), which account for a funding share of up to 50% in the case of sidings, feeder lines and industrial lines, and up to 80% in the case of multifunctional facilities.

Links:

https://www.eba.bund.de/DE/Themen/Finanzierung/Gleisanschluesse/gleisanschluesse_node.html

The federal government provides grants for the construction, reactivation, upgrading and replacement of sidings, multifunctional facilities, feeder lines and industrial lines to the extent that they are necessary to achieve the funding objectives.[17] There is no automatic entitlement to the grants. The Federal Railway Authority, which is the granting authority, decides at its due discretion based on the available budget funding. The construction and reactivation of sidings is aimed mainly at shifting freight from road to rail, while the upgrading of sidings is targeted towards generating more traffic via existing sidings. Replacement measures aim to keep existing rail freight traffic on the railways.

The basic aim of funding sidings is to increase rail traffic volumes. Calculations to this effect are based on a 2019 evaluation of the sidings funding guidelines over the evaluation period of August 2004 (when the funding was introduced) to September 2019 (the assessment cut-off date) and an evaluation scope of 125 projects (funded sidings) with a funding volume of €91.7 million. In terms of rail transport performance, new and additional traffic totalling 38,900 million tkm was generated in the evaluation period. This means an average 424 million tkm transport performance was shifted to rail or additionally generated for each €1 million in funding. Likewise in 2019, on the basis of the TREMOD project, the Federal Environment Agency (*Umweltbundesamt*) published a comparison of greenhouse gas emissions from the various modes of freight transport. This showed that rail freight can reduce greenhouse gas emissions by an average of 84 g/tkm compared to road freight. Based on the 424 million tkm transport performance generated in the above evaluation period, this corresponds to a reduction in CO_2e emissions totalling 35,600 tonnes per €1 million in funding.

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[17] Funding guidelines: https://www.eba.bund.de/SharedDocs/Downloads/DE/Finanzierung/Gleisanschluesse/01_Anschlussfoerderrichtlinie/01_00_RIL_Neu-_und_Ausbau_Gleisanschluesse.pdf?__blob=publicationFile&v=9

1.2. Alternative drive systems and fuels

1.2.1. Engines and Modernisation for Inland Navigation funding programme

	2022	2023
Budget chapter and item:		1210 683 13
Eligible expenditures:		€14.2 million
GHG emission reduction:		Not available
Projects:		10
Funding share:		Maximum 80%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: Most of the projects span several years. The process of constructing cost-intensive new inland waterway vessels with innovative fuel cell technology is particularly time-consuming in terms of both planning and implementation.

Links:
https://bmdv.bund.de/SharedDocs/DE/Artikel/WS/foerderrichtlinie-nachhaltige-modernisierung-binnenschiffe.html

The federal government's transport policy places a high priority on promoting inland navigation, which is a comparatively sustainable form of transport when measured in terms of transport volume. Progress towards climate-neutral inland navigation can be achieved only through the use of emission-free and low-emission motors and drives. This must take into account the fact that inland waterway vessels have a long lifespan. Roughly 80% of inland waterway vessel operators are self-employed vessel owners who live and work on their vessels with their families.

The "Engines and Modernisation for Inland Navigation" (*Motoren und Modernisierung für die Binnenschifffahrt*) funding programme is designed to further increase the sustainability of inland waterway vessels by further reducing their emissions impact. By (a) equipping and converting inland waterway vessels with emission-free and low-emission engines and (b) retrofitting them with emissions reduction systems, the programme aims to ensure that inland navigation can continue to contribute to the achievement of air pollution control and climate targets in the transport sector.

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1.2.2. Subsidies for research, development and pilot projects for the market activation of alternative fuel use and the establishment of a corresponding filling and charging infrastructure

	2022	2023
Budget chapter and item:	1210 686 61	
Eligible expenditures:	€5.4 million	€1.4 million
GHG emission reduction:	Not available	Not available
Projects:	6	4
Beneficiaries:	13	10
Funding share:	80.22%	89.80%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: The impact data refers to the total investment amount (comprising federal funding and the beneficiaries' own contributions) of €6.8 million in 2022 and €1.6 million in 2023. Eligible expenditures accounted for 80.22% of the total investment amount in 2022. Eligible expenditures accounted for 89.80% of the total investment amount in 2023.

Links: --

The subsidies under the Mobility and Fuels Strategy (*Mobilitäts- und Kraftstoffstrategie*) are provided for research and development projects to establish charging infrastructure for public transport, to convert vehicles to alternative propulsion systems, and to finance a planning tool for the identification of infrastructure needs throughout Germany.

	2022		2023	
Project name	**Number of projects**	**Number of beneficiaries**	**Number of projects**	**Number of beneficiaries**
Infrastructure projects for stationary and dynamic charging of local transport buses (e.g. "BOB Solingen" joint project for dynamic charging of trolleybuses)	5	11	4	10
Vehicle conversion ("HyBat truck" joint project for hybrid hydrogen/battery trucks)	1	2	-	-

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1.2.3. Measures for the expansion of electric mobility

	2022	2023
Budget chapter and item:	6092 683 04	
Eligible expenditures:	€256.9 million (BMBF + BMWK)	€328.9 million (BMBF + BMWK + BMDV)
GHG emission reduction:	About 1 million t CO_2e for charging infrastructure module (BMWK)	About 1 million t CO_2e for charging infrastructure module (BMWK)
Projects:	688 (BMBF) 715 (BMWK)	769 (BMBF) 757 (BMWK)
Vehicles:	3,064 (BMWK)	1,370 (BMDV) 4,124 (BMWK)
Charging infrastructure:	4,216 (BMWK)	380 (BMDV) 2,751 (BMWK)
Funding share:	33%	33% (BMBF + BMWK) 54.1% (BMDV)
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	d) e)

Assumptions and limitations:

BMBF and BMWK: In general, the project duration is three years. Therefore, the funding share is stated as 33%. Third-party financing is not taken into account.

BMDV: The funding share was calculated as the ratio of funding to eligible expenditures in 2023. However, eligible expenditures comprise only the additional costs of e-vehicles over the costs of counterfactual purchases of conventional vehicles. Thus, the ratio of funding to the total investments precipitated by the funding is lower than the figure shown here.

BMWK: Vehicles are funded only from the "Sozial & Mobil" programme. Charging points are funded from both the "Sozial & Mobil" programme (777 in 2022, 931 in 2023) and the "Elektro-Mobil" programme (3,439 in 2022, 1,820 in 2023).

The reduction in GHG emissions cited above was derived from the research accompanying the "Elektro-Mobil" programme and refers solely to the programme's charging infrastructure module. The reduction of approximately one million t CO_2e covers the entire lifespan of the charging infrastructure funded from that year's eligible expenditures.

Links:

2022: https://www.batterieforum-deutschland.de/projektdatenbank/

2023: https://becosearch-content.batterieforum-deutschland.de/startseite/

www.batterieforschung.de

BMWK:

BMWK - Elektro-Mobil; Digitale Technologien - Startseite

Ziele | Erneuerbar Mobil

General

The federal government aims to make Germany a leading market for and provider of electric mobility. Automotive production is shaped by the overarching global trends towards digitalisation, electrification and decarbonisation. In addition, there are new, innovative business areas that will make it possible to continue generating added value throughout a vehicle's operating life, rather than only during the production stage. In order to help ensure that the far-reaching transition to electric mobility succeeds, the federal government is providing R&D funding for various parts of the electrification process. The funding programmes are divided up amongst government ministries in accordance with the various ministry remits. The research covers a vast range of topics, as reflected in the submitted project outlines. Examples include innovative and high-performance powertrains, battery research, system integration and charging infrastructure (including bidirectional charging, where electric vehicles become a bridge between mobility and energy systems).

Programmes funded by the Federal Ministry for Economic Affairs and Climate Action (BMWK) (eligible expenditures: €145.3 million in 2022, €172.1 million in 2023)

The BMWK's brochure for the "Elektro-Mobil" programme provides a description of over 100 projects that receive programme funding. This brochure is available at:

https://www.bmwk.de/Redaktion/DE/Publikationen/Technologie/elektro-mobil-programmbroschure.pdf?__blob=publicationFile&v=13

The dedicated website "Erneuerbar mobil" ("Renewable mobility") describes additional projects that receive funding. This brochure is available at:

https://www.erneuerbar-mobil.de/projekte

Examples of funded projects include:

- Bid-E-V (bidirectional electric vans): The Bid-E-V project conducts pilot tests with electric delivery vehicles that not only use energy but also supply energy back to the electricity grid. This research project focuses on bidirectional charging for heavy duty vehicles. It aims to enable logistics companies to provide electricity services, significantly enhancing the economic performance of their e-fleets, not only at the "last mile" (i.e. the final stage of the supply chain to end-consumers) but also at vehicle depots. Bidirectional commercial vehicles and energy management will also enable logistics companies to achieve a high level of self-sufficiency in the commercial use of solar power.
- MAD Urban (Managed Automated Driving): The MAD Urban project's objective is to shift the sensor technology for the full control and regulation of automated vehicles to external infrastructure, since vehicle-based automation systems alone are unable to handle the complex traffic conditions of cities. By testing and implementing local infrastructure-based sensor and communication systems, the project aims to facilitate the safe and cost-effective operation of automated vehicles in urban areas for the first time.
- ReAGraph: The ReAGraph project is developing an electrohydraulic process to recover graphite from the anode material of lithium-ion batteries. In addition, it aims to develop application scenarios (and related specifications) for recovered graphite (e.g. re-use in batteries and alternative applications).
- BiFlex: The BiFlex Industry project aims to demonstrate specific use cases for bidirectional electric vehicles operated at commercial and industrial sites. Project partners want to highlight the direct benefits of vehicle fleets capable of feeding energy back into the grid for companies and energy industry business models. They also intend to demonstrate that vehicle fleets can be integrated on a large scale into existing systems and thereby serve as the nucleus for fleet power plants.
- BDL Next (Bidirectional Load Management): The BDL Next project is

conducting a field test using production vehicles with energy management systems to integrate vehicles fully and automatically into various use cases. The aim is to demonstrate the feasibility of mass bidirectional charging technology, which would further increase added value for consumers, the electricity grid and the energy system.

- WINNER Final: The WINNER Final project aims to convert ideas for the smart use of bidirectional electric vehicle charging into everyday practice. This will facilitate sustainable charging systems for EV fleets, carsharing schemes and privately-owned EVs, in both commercial and residential settings. Residential and commercial areas involved in the project will use bidirectional charging as a way to promote an efficient load and charging management system that can ease the strain on power grids.

Programmes funded by the Federal Ministry of Education and Research (BMBF) (eligible expenditures: €111.6 million in 2022, €133.6 million in 2023)

In addition to supporting the further development and upscaling of lithium-ion batteries, BMBF funding also focuses on (a) the development of promising new battery technologies such as solid-state batteries and (b) the optimisation of process technologies and battery materials along the entire (ideally circular) value chain. This will enable the more efficient use of resources such as lithium and nickel or their substitution with more readily available alternatives. In parallel, energy efficiency is being improved in production and application. For example, intelligent, digitalised production processes reduce production waste and carbon emissions. A further funding objective is to reduce resource dependency by means of second-use applications and recycling.

In 2022, the BMBF's funding for battery-related projects included a focus on the establishment of competence clusters. The BMBF provided funding for seven battery competence clusters in 2022. These competence clusters are targeted towards key priorities along the entire battery value chain (projects and publications are presented on the websites of each competence cluster):

- The "ExcellBattMat" (battery materials) cluster develops, characterises and tests new material solutions for battery systems of the future.[18]
- The "FestBatt" (solid-state batteries) cluster focuses on material-specific issues relating to solid-state batteries as a battery technology of the future.[19]
- The "ProZell" and "InZePro" clusters focus on issues relating to (intelligent) battery cell production. This involves research into battery cell production processes, including their influence on battery material, component and cell properties, product manufacturing costs and greenhouse gas emissions. Production system optimisation using "Industry 4.0" solutions also plays a major role here.[20]
- Complementing these efforts, the "AQua" cluster aims to develop strategies and standards for analysis and quality assurance in battery and battery cell production.[21]
- The "greenBatt" cluster focuses on the systematic design of the battery life cycle, incorporating and improving efficient recycling technologies and integrating recovered materials into battery cell production.[22]
- Finally, the "BattNutzung" (battery utilisation concepts) cluster is developing a deeper understanding of battery conditions and the performance of battery cells and batteries over their lifetime. Consideration is also being given to the resulting impact on various battery

[18] https://www.uni-muenster.de/ExcellBattMat/en/cluster/index.html
[19] https://festbatt.net/en
[20] https://prozell-cluster.de/en/ and https://www.inzepro-cluster.de
[21] https://www.aqua-cluster.de
[22] https://www.greenbatt-cluster.de/en/

applications, including second-life applications.[23]

The BMBF's "General strategy for battery research (*Dachkonzept Batterieforschung*) was published in January 2023. It lays out the strategic basis for BMBF funding that supports holistic battery technology research using circular economy principles. The aim is to build a competitive, sustainable and technologically sovereign battery value chain for Germany and Europe. The strategy places a particular emphasis on material and component development, processing and production technology, recycling, circular economy methods, digitalisation, and research targeted towards scaling. Lithium-ion systems as well as alternative battery technologies such as sodium-ion systems are included in the strategy's focus. The strategy includes numerous additional objectives. It aims to reduce dependencies on raw materials and components. It also aims to incorporate, expand and – where necessary – build expertise along the entire battery value chain. In addition, it will promote and expand targeted national and international collaboration between the research and business communities, thereby creating a high-performing innovation ecosystem that encompasses scientific and industrial stakeholders. The strategy also specifically targets and includes small and medium-sized businesses and aims to improve the training and availability of skilled staff with research and technical expertise.

Various funding approaches – such as market-based and demand-based funding instruments – play a key role in the strategy. One of the strategy's central pillars is the promotion of battery competence clusters. In 2023, the BMBF provided funding for seven battery competence clusters that focus on key issues along the entire battery value chain. In the future, competence cluster funding will be merged within a single instrument. The funding programme "Clusters Go Industry (CGoIn)" was published in February 2023. This programme consolidates and continues successful research activities and creates a flexible instrument for supporting science-based, industry-oriented battery research. In addition to the competence clusters, the BMBF launched a funding programme in 2023 called "Battery technology R&D to build competitive, sustainable and technologically sovereign battery value chains (B@TS)" (*Forschung und Entwicklung an Batterietechnologien für technologisch souveräne, wettbewerbsfähige und nachhaltige Batteriewertschöpfungsketten* (B@TS)). This programme is another key pillar in the targeted implementation of the general strategy.

Programmes funded by the Federal Ministry for Digital and Transport (BMDV) (eligible expenditures: €23.2 million in 2023)

- Electric Mobility Funding Guidelines – Immediate Action Programme for Clean Air

Under the Electric Mobility Funding Guidelines (*Förderrichtlinie Elektromobilität*), two special calls were issued as part of the federal government's Immediate Action Programme for Clean Air (*Sofortprogramm Saubere Luft*). These calls were targeted towards the conversion of local authority vehicle fleets in communities with elevated NO_x levels. Since 2018, these calls have led to the approval of 392 projects with a total funding volume of €256 million.

The last of these projects was completed in 2023, which made it possible to draw overall conclusions. Of the 392 projects that were approved, 337 were completed. 67% of the total amount of approved funding was disbursed. Nevertheless, the number of vehicles procured (10,330) was only slightly lower than the number of vehicles approved (11,665). In fact, the number of vehicles procured as part of the first special call was actually slightly higher than the original number of approved vehicles.

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[23] https://www.battnutzung-cluster.de/en/

1.2.4. Grants for the purchase of commercial vehicles with alternative, climate-friendly engines; subsidies for the construction of filling and charging infrastructure

	2022	2023
Budget chapters and items:	6092 893 02 and 6092 893 08	
Eligible expenditures:	€63.6 million	€152.9 million
GHG emission reduction:	Not available	0.166 million t CO_2e (funded commercial vehicles only)
Non-public charging points:	50,754 commercial 30 municipal	58,968 commercial 753 municipal
Public charging infrastructure put into operation:	2,562 charging points	6,699 charging points
Funded commercial and special vehicles:	Not available	232
Funding share:	70% for non-public charging points Maximum 60% for public charging infrastructure	70% for non-public charging points Up to 80% for public charging infrastructure
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: The 0,166 million t GHG emission reduction in 2023 refers solely to the 232 commercial and special vehicles funded through budget item 893 08 with eligible expenditures of €31.6 million. In 2022, GHG emission reduction could not be calculated due to a lack of operational data at that time. The installation of charging stations is a preparatory measure for subsequent GHG emissions reductions. However, charging stations themselves do not directly reduce GHG emissions.

The 2022 and 2023 eligible expenditures to promote public charging infrastructure include the charging points that were put into operation in 2022 and 2023 as well as charging points that were put into operation in previous years but for which funding was not disbursed until 2022 or 2023.

As regards the funding that was provided for public charging infrastructure in 2023, a distinction is made between funding from the programme "Electric Vehicle Charging Infrastructure in Germany" (*Ladeinfrastruktur für Elektrofahrzeuge in Deutschland*, or LIS) and funding from the programme "On-Site Charging Infrastructure" (*Ladeinfrastruktur vor Ort*, or LvO). In 2022, funding was provided only from the LIS programme. Most of the charging points that were put into operation in 2023 received funding from the LvO programme (which accounted for 6,478 charging points). The funding shares for the two programmes are: up to 60% for the LIS programme and up to 80% for the LvO programme.

Links: https://www.kfw.de/inlandsfoerderung/Unternehmen/Energie-und-Umwelt/F%C3%B6rderprodukte/Ladestationen-f%C3%BCr-Elektrofahrzeuge-Unternehmen-(441)/

Electric vehicle charging infrastructure in Germany (LIS): https://bmdv.bund.de/SharedDocs/DE/Artikel/G/foerderrichtlinie-ladeinfrastruktur-elektrofahrzeuge.html

On-site charging infrastructure (LvO): https://bmdv.bund.de/SharedDocs/DE/Artikel/G/foerderrichtlinie-ladeinfrastruktur-elektrofahrzeuge.html

Climate-friendly commercial vehicles (KsNI): https://www.klimafreundliche-nutzfahrzeuge.de/foerderung/zahlen-foerderprogramm/

Funding guidelines for the programme "On-Site Charging Infrastructure" (*Ladeinfrastruktur vor Ort*, LvO), published on 24 March 2021

The "On-Site Charging Infrastructure" programme covered up to 80% of investment costs. Eligible applicants included natural persons, SMEs (especially businesses in the retail, hotel and hospitality sectors) and local authorities. Applications had to be submitted by 31 December 2021. The aim of the funding was to accelerate the establishment of publicly accessible charging infrastructure at attractive everyday destinations (see the indicator "public charging points"). With funding from this programme, 8,439 charging points were put into operation by the end of 2023.

Funding guidelines for the programme "Electric Vehicle Charging Infrastructure in Germany" (*Ladeinfrastruktur für Elektrofahrzeuge in Deutschland*, LIS), published on 13 February 2017

Under the funding guidelines for the programme "Electric Vehicle Charging Infrastructure in Germany", a total of six calls for funding were published between February 2017 and June 2020. Approximately 7,200 applications were submitted. The programme aimed to establish a nationwide, needs-based, user-friendly charging infrastructure network. Funding was provided to help cover the costs not only of charging stations themselves, but also of related grid connections and combinations of grid connections/buffer storage. Funding can be used to help cover the costs not only of procuring and installing charging infrastructure at new locations, but also of upgrading and replacing charging infrastructure and grid connections at existing locations (see the indicator "public charging points"). With funding from this programme, 2,783 charging points were put into operation in the years 2022 and 2023.

Federal aid scheme for the acquisition of light and heavy commercial vehicles with alternative, climate-friendly propulsion systems, ancillary recharging and refuelling facilities and feasibility studies (*KsNI-Richtlinie*)

This funding programme provides partial funding for (a) technology-related extra investment costs for commercial vehicles with climate-friendly drives, (b) feasibility studies (financed from budget item 893 08) and (c) investments in the related necessary filling and charging infrastructure (budget item 893 02). Technology-related extra investment costs for (a) commercial vehicles of EU categories N1, N2 and N3, (b) battery-electric special vehicles, (c) fuel-cell special vehicles and (d) plug-in hybrid vehicles are eligible for funding. This programme creates strong incentives for switching to climate-friendly commercial vehicles in the road freight transport sector.

Funding guidelines for the programme "Non-publicly accessible charging stations for electric vehicles – companies and local authorities" (*Nicht öffentlich zugängliche Ladestationen für Elektrofahrzeuge – Unternehmen und Kommunen*)

These funding guidelines were published on 17 November 2021 and expired on 31 December 2022. This BMDV funding programme supported the installation of charging infrastructure (a) in employee car parks, (b) for company or local authority electric vehicle fleets and (c) for service vehicles. Funding was provided to help cover the costs of procuring and installing charging stations for commercial electric vehicles (especially fleets) and for employees of companies and local authorities. Funding was also available to help cover the costs of hardware and work related to grid connections. Charging points with a charging capacity of up to 22 kilowatts (and their related connections) were eligible for funding. The funding aimed to encourage companies and local authorities (and their employees) to switch to electric vehicles and to help make sufficient charging infrastructure available for this purpose (see the indicator "non-public charging points").

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1.2.5. Promotion of purchases of buses with alternative drives

	2022	2023
Budget chapter and item:	6092 893 09	
Eligible expenditures:	€116.6 million	€114.9 million
GHG emission reduction:	0.27 million t CO_2e	0.20 million t CO_2e
Electric buses:	435	324
Charging points:	985	985
NO_x emission reduction:	About 0.12 t	About 0.09 t
Particulate matter (PM) reduction:	About 12 kg	About 9 kg
Funding share:	Maximum 80%	Maximum 80%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	e)

Assumptions and limitations: Data on funded vehicles and environmental impacts refers to the electric buses that entered service in the respective calendar year and their expected 12-year lifespan. Impact indicators for annual eligible expenditures are determined as follows: the number of e-buses entering service in a given year is calculated (expressed as a percentage of the total number of e-buses entering service (1,489)), and this percentage is then applied to the total impacts calculated as part of the accompanying research.

Links:

Accompanying study: https://www.pwc.de/de/branchen-und-markte/oeffentlicher-sektor/begleituntersuchung-zur-foerderung-von-elektrobussen-im-oepnv.pdf

Under the "Guidelines for the Procurement of Electric Buses in Public Transport" (*Richtlinie zur Anschaffung von Elektrobussen im ÖPNV*), the BMWK (and before that, the BMUV) has provided funding since 2018 to promote the conversion of bus fleets to battery-electric vehicles. After obtaining approval under EU state aid rules, the funding guidelines took effect on 16 March 2018. The guidelines did not set a specific CO_2 reduction target.

The funding programme's objective was to ensure that bus fleets (or at least entire bus routes) in individual cities consisted entirely of emission-free vehicles. In addition to climate change mitigation, the programme was also targeted towards air quality control and noise control. For this reason, a priority was placed on providing funding for cities and regions with high levels of air and noise pollution. Due to the high purchase price of electric buses compared with diesel buses, a broader dissemination of electric buses would not have been feasible without support for companies. Thus, the programme also aimed to give a boost to the market for electric buses: mutual learning processes and economies of scale would spur greater competition that, in turn, would reduce high purchase prices and thereby facilitate a self-sustaining market.

During project period (starting in 2018), 65 projects in over 60 cities and regions were approved. Disbursements of the full amounts of approved funding continued in 2022, 2023 and 2024. After that, there were no further calls for funding. With a total funding volume of €497.51 million, the programme helped to finance 1,489 electric buses and 985 charging points. This represents a 15 fold increase of electric buses in operation before the programme was launched (about 100 electric buses).

Examples of beneficiaries	Total funding amount (in € million)	Number of e-buses	Number of charging points
2022			
KVG Kiel (Kiel public transport)	34.33	70	69
Stadtwerke Münster (Münster public utilities)	14.92	56	0
2023			
HEAG Mobilo (Darmstadt public transport)	8.88	29	0
RSVG (Rhein-Sieg district public transport)	1.31	6	0

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1.3. Public transport

1.3.1. Financial assistance to the *Länder* for railbound local public transport infrastructure

	2022	2023
Budget chapter and item:	1206 882 02	
Eligible expenditures:	€520.4 million	€545.3 million
GHG emission reduction:	Not available	Not available
Projects:	44	62
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	
Assumptions and limitations: --		
Links: --		

Due to its energy efficiency and high degree of electrification, public transport produces significantly less greenhouse gas emissions per passenger kilometre than private motorised transport. Shifting from private motorised transport to public transport can therefore reduce greenhouse gas emissions from the transport sector. This requires attractive and user-friendly local public transport. However, a modal shift from private motorised transport to public transport aims to reduce greenhouse gas emissions and plays an important role in making cities and communities more eco-friendly.

Since regional and local public transport is the responsibility of the *Länder* and local authorities, the federal government provides indirect support in the form of financial assistance. Impact indicators are not available in the aggregate. An example from Hamburg is provided below; further examples can be found in the 2021 and 2022 Impact Reports.

New underground railway line in Hamburg, eastern section

The city of Hamburg and Hamburger Hochbahn AG are planning a new, fully automated underground railway line (the U5 line) that will ultimately cover a distance of over 20 kilometres. The first section, which is already under construction, consists of five stations connecting the Barmbek district in the east with the City Nord business district and covering a distance of about 5.8 kilometres. This section will be entirely underground, and will serve an area with over 100,000 inhabitants, about one-third of whom will be within walking distance of rapid transit for the first time.

Further information (on the section under construction, and on the overall project) is available at: https://www.hochbahn.de/en/projects/underground-expansion/the-u5-for-hamburg.

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1.3.2. Investment subsidies for major public transport projects to Deutsche Bahn AG and companies majority-owned by the federal government

	2022	2023
Budget chapter and item:	1206 891 01	
Eligible expenditures:	€381.7 million	€453.0 million
GHG emission reduction:	Not available	Not available
Projects:	18	23
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	
Assumptions and limitations: --		
Links: --		

Due to its energy efficiency and high degree of electrification, public transport produces significantly less greenhouse gas emissions per passenger kilometre than private motorised transport. Shifting from private motorised transport to public transport can therefore reduce greenhouse gas emissions from the transport sector. This requires attractive and user-friendly local public transport. However, a modal shift from private motorised transport to public transport aims to reduce greenhouse gas emissions and plays an important role in making cities and communities more eco-friendly.

Since regional and local public transport is the responsibility of the *Länder* and local authorities, the Federal Government provides indirect support in the form of investment subsidies. Aggregate impact indicators are not available. An example from Schleswig-Holstein is provided below; further examples can be found in the 2021 and 2022 Impact Reports.

Construction and upgrade of charging infrastructure for battery-powered multiple-unit trains in Schleswig-Holstein

The Nahverkehrsverbund Schleswig-Holstein GmbH (or NAH.SH), the passenger transport authority in the *Land* of Schleswig-Holstein, plans to deploy battery-electric multiple unit railroad vehicles (BEMU) which use an innovative drive technology. These new vehicles will replace the existing diesel-powered fleet and will be equipped with built-in batteries that enable them to operate on non-electrified track sections. This operating plan will require the batteries to be recharged at certain stations, some of which are located in non-electrified sections of the rail network. To enable recharging, three stand-alone overhead contact line systems are to be set up, and existing overhead contact lines at various locations are to be upgraded. The conversion of rail operations to electric drive technology is expected to reduce CO_2 emissions by over 11,000 tonnes per year.

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1.3.3. Measures to digitalise local transport systems

	2022	2023
Budget chapter and item:	1210 883 81	1210 883 01
Eligible expenditures:	€73.3 million	€67.0 million
GHG emission reduction:	Not available	Not available
Projects:	268 (multi-year)	254 (multi-year)
Funding share:	57%	59%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: Digitalisation measures improve local transport systems and increase the efficiency of public transport and the attractiveness of ecomobility. They also promote the interconnection and digitalisation of local mobility as a whole.

Their GHG emission reduction impact is therefore achieved indirectly. The funded projects are so varied in subject matter and scale that it is not possible to precisely quantify their aggregate reduction impact.

The funding rate under the applicable funding guidelines was up to 65% in 2022 and 2023, and up to 80% in exceptional cases. On average, the share of federal funding was 57% for all 268 measures in 2022, and 59% for all 254 measures in 2023.

Links: www.bmdv.bund.de/dkv ; examples of projects: https://bmdv.bund.de/DE/Themen/Mobilitaet/Urbane-Mobilitaet/DKV-Projektsteckbriefe/dkv-projekte.html;
https://bmdv.bund.de/SharedDocs/DE/Artikel/foerderlandkarte-bmvi-iframe.html

With the funding programme "Digitalisation of Local Transport Systems" (*Digitalisierung kommunaler Verkehrssysteme*), the federal government is supporting the digital transformation of urban mobility. This will boost transport system efficiency, help to avoid congestion through smart mobility solutions, streamline chained intermodal journeys by offering demand-driven, multi-provider digital services and make public mobility services more attractive for increased take-up. By reducing greenhouse gas emissions and air pollution, the projects contribute indirectly to climate change mitigation and to environmental and health protection. Numerous project descriptions are available at: https://bmdv.bund.de/DE/Themen/Mobilitaet/Urbane-Mobilitaet/DKV-Projektsteckbriefe/dkv-projekte.html.

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1.3.4. Model projects to strengthen public transport

	2022	2023
Budget chapter and item:		6092 633 02
Eligible expenditures:		€95.0 million
GHG emission reduction:		Not available
Projects:		19
Funding share:		Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: --

Links: bmdv.bund.de/SharedDocs/DE/Artikel/G/oeffentlicher-personenverkehr-foerderung.html

Support is provided for model projects to improve public transport. These projects will sustainably reduce CO_2 emissions in the transport sector by making public transport more attractive.

Specifically, the selected model projects aim to put innovative and creative solutions into practice. The ideas include increasing the frequency of services, building and upgrading mobility stations, introducing and expanding flexible on-demand transport, and developing digital and intermodal mobility platforms.

Experience gained from implementing these projects will also be used to benefit other cities and regions. For this reason, the projects are monitored and evaluated scientifically in terms of their potential to reduce CO_2 emissions.

Findings on CO_2 reductions resulting from the projects are expected in 2025 (for the first call for funding) and 2026 (for the second call for funding). Accordingly, conclusions regarding funding efficiency (carbon savings vs. funding disbursed) cannot be drawn until after the project support has ended.

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1.4. Cycling

1.4.1. Construction of cycle paths including maintenance (federal highways)

	2022	2023
Budget chapter and item:	1201 746 22	
Eligible expenditures:	€113.3 million	€112.0 million
GHG emission reduction:	Not available	Not available
Newly built cycle paths:	154 km	120 km
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: No kilometre figures are available for maintenance measures on existing cycle paths.

Links: --

The federal budget finances the construction and maintenance of cycle paths along federal roads. A total of 154 km of newly constructed cycle paths along federal roads were completed in the 2022 fiscal year, and 120 km in 2023. In addition to new construction, maintenance was also financed, although no km figures are available for this.

Project examples: The B 462 federal highway between Weisenbach and Gernsbach-Hilpertshau: closing the gap in the cycle path (multi-year project)

The "Tour de Murg" is a designated cycle route along the Murg river between the towns of Freudenstadt and Rastatt in the northern Black Forest. This designated route mainly consists of cycle paths and farm tracks running parallel to the B 462 federal highway.

In some sections, the route runs directly on local and district roads. However, there is one relatively short section between the communities of Weisbach and Gernsbach-Hilpertsau where cyclists currently have to share the carriageway of the B 462 with motorised traffic. This poses a major accident risk given the popularity of cycling tourism. The project's main aim is therefore to improve road safety by closing the gap in the cycle path. This will be achieved primarily by building an attractively designed bridge over the Murg river and adding the necessary connections between the cycle path and the bridge. This multi-year measure is expected to cost approximately €10.7 million, spread out over the period from 2020 to 2025.

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1.4.2. Grants and subsidies in the area of cycling

- Implementation of the National Cycling Plan (*Nationaler Radverkehrsplan*) – grants to *Länder* and other public-law entities
- Implementation of the National Cycling Plan – subsidies to companies under private law
- Grants to *Länder* for the construction of cycle highways
- Funding of pilot projects in the area of cycling – subsidies to *Länder* and other public-law entities
- Subsidies for the upgrading and expansion of the German Cycling Network (*Radnetz Deutschland*)

	2022	2023
Budget chapters and items:	1210 632 91, 1210 686 91, 1210 882 91, 1210 891 91, 1210 891 92	
Eligible expenditures:	€20.5 million	€42.8 million
GHG emission reduction:	0.070 million t CO_2e	0.212 million t CO_2e
Measures:	177	198
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: Only eligible expenditures from budget items 1210 891 91 and 1210 891 92 count towards GHG emission reductions. In 2022, budget item 1210 891 91 (eligible expenditures: €5.5 million) accounted for emission reductions totalling 21,870 t CO_2e, and budget item 1210 891 92 (eligible expenditures: €4.9 million) accounted for emission reductions totalling 48,170 t CO_2e. In 2023, budget item 1210 891 91 (eligible expenditures: €11.4 million) accounted for emission reductions totalling 41,620 t CO_2e, and budget item 1210 891 92 (eligible expenditures: €14.5 million) accounted for emission reductions totalling 170,590 t CO_2e.

GHG reduction category: indirect (shift away from individual motorised transport)
Value type: gross; before-after gross

Explanation: The BMDV received scientific advice and guidance for the purposes of fine-tuning its Mobility and Fuels Strategy. This included a study estimating the climate impacts of cycling infrastructure measures. Specifically, this study conducted an ex-ante impact assessment (not an evaluation) of (a) the shift to cycling as a mode of transport and (b) the (resulting) climate impacts (potential GHG reduction) attributable to BMDV financial assistance and funding programmes. To download the study, see the link below.

The pro rata amount of GHG savings for each reporting year was calculated on the basis of the ratio between (a) the funds actually disbursed during the respective reporting year and (b) total funding for the respective programme (this was the basis for calculating the estimated GHG reduction potential). The data provided here represents the cumulative amount of GHG savings that the funding disbursed in the respective year is expected to achieve by 2045. The values listed here are the ones derived from the *Fahrradland* ("cycling country") scenario. The various scenarios in the study differ in their assumptions depending on the development of the overall economic and transportation conditions and the associated mobility behaviour.

Links: https://bmdv.bund.de/SharedDocs/DE/Artikel/StV/Radverkehr/klimaschutz-im-verkehr.html

The federal government supports cycling by implementing measures from the National Cycling Plan 3.0, by promoting innovative model cycling projects and by providing grants aimed at the expansion of Germany's cycling network. It also provides the *Länder* with financial assistance for planning and building cycle highways.

The measures implemented under the National Cycling Plan are wide-ranging. They include the construction and conversion of cycle paths, cycle path underpasses, overpasses and intersections, the removal of unsignalised right-turn lanes, the construction of bicycle parking facilities (bicycle racks, bicycle boxes and bicycle parking garages) and the organisation of the National Cycling Congress, the Bicycle Climate Test and the German Bicycle Award. The National Cycling Plan facilitates multifaceted improvements that boost cycling as a whole. The plan's recommended measures for expanding and upgrading cycling infrastructure improve conditions for cycling, thereby boosting the use of bicycles as a mode of transport.

Under the funding guidelines for non-investment measures to implement the National Cycling Plan, funding is granted to non-investment cycling-related projects that advance the Plan's objectives and the implementation of the government's overall cycling strategy. The projects are required to either deliver outcomes that are replicable in similar applications – that is, they serve as a model and are not just a one-off activity that can only be implemented at a single location – or produce new knowledge about the thematic area concerned. Eligible projects of this kind include research and development projects, information and communication campaigns, competitions, and other suitable projects that aim to coordinate and promote cycling.

Project example in 2022:

The project "The Needs of Cyclists and Pedestrians near Construction Sites – a Traffic Psychological Analysis of User-Specific Requirements" (*Bedürfnisse von Rad- und Fußverkehr an Baustellen – Verkehrspsychologische Analyse zu nutzerspezifischen Anforderungen*) aims to analyse and optimise traffic safety and traffic control measures in order to ensure the safety of cyclists and pedestrians near urban and non-urban construction sites.

Project examples in 2023:

The project "Bike to school – so cool!" (*Bike to school – wie cool!*) consists of a digital toolbox that can be used in schools to promote cycling among young people. It is targeted towards students in general and vocational education and aims to make young people aware of their own influence on transport conditions and to take initiative in this respect. In particular, it aims to (a) encourage an appreciation of cycling as a climate-friendly and inexpensive mode of transport accessible to everyone and (b) encourage young people to make a conscious decision to use bikes as a mode of transport.

The funding guidelines for innovative projects to improve cycling in Germany aim to spawn "flagship cycling projects" (innovative building and civil engineering measures) that serve as model projects, increase bike traffic and enhance the attractiveness of cycling in Germany. The aim is to test models and apply them in practice in order to develop new ideas and approaches that can also make valuable contributions to improving cycling elsewhere in Germany. The federal funding creates incentives and momentum. In addition, because the results are replicable, it facilitates equivalent living conditions, for example through the provision of cycle overpasses, underpasses, fully automated cycle parking garages and cycle-friendly crossing solutions at major intersections. Projects can also include measures and mobility concepts that combine cycling with other climate-neutral or climate-friendly modes of transport.

One project example is the fully automated cycle parking garage in the city of Osnabrück. Located next to the Altstadt railway station (a key public transport hub), this high-tech bike tower provides 160 safe and attractive parking spaces tailored to the needs of various user groups. A two-storey installation next to the bike tower also offers a cost-free option for bike parking. This measure helps to increase the use of bicycles and also reinforces the

intermodal interface between cycling and public transport. Thanks to the artwork decorating the structure, the cycle parking garage has become a colourful symbol of cycling in the city of Osnabrück. The cycle parking garage was completed in 2023.

Another project example is the Georgsberg bicycle/pedestrian tunnel in the city of Passau, which opened in 2024. By providing separate lanes for cyclists and pedestrians, the new tunnel improves both safety and travel convenience. It also features innovative lighting that keeps the tunnel bright and welcoming, thus preventing it from having areas that could feel dangerous.

The German Cycling Network (*Radnetz Deutschland*) is a funding programme that aims to create a safe, comprehensive and attractive network of long-distance cycle routes across all German *Länder* and to establish Germany as a "cycling country" for everyday tasks, leisure and tourism. The German Cycling Network consists of the German Unity Cycle Route, the Iron Curtain Trail and 12 "D-Routes" – an extensive network of long-distance cycle routes spanning the entire country which are integrated into EuroVelo, the European cycle route network.

One project example is the upgrade of the D-Route 11 along the river cycle path "Main-Saale-Elster" in the district of Hof (Bavaria). This project encompassed the creation of safe crossings as well as the construction of a separate cycle track alongside a busy (and thus unsafe) rural highway in 2023.

In another project, the city of Trier repaired the surface of the section of the Moselle cycle path (part of D-Route 5) running through the city. This enhances the D-Route's attractiveness for cyclists from Germany and abroad, promoting climate-friendly tourism. This project was completed in 2024.

Until the end of 2030, under section 5b of the Federal Trunk Roads Act (*Bundesfernstraßengesetz*), the federal government can grant financial assistance to the *Länder* for the purpose of building cycle highways that fall under the road construction remit of the *Länder*, local authorities and local authority associations. To this end, an administrative agreement was adopted in 2017 that contains a percentage-based formula for apportioning federal financial assistance among the various *Länder*. Funding for cycle highway measures totalled approximately €3.1 million in the fiscal year 2022, and approximately €8.5 million in the fiscal year 2023.

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1.4.3. Financial assistance to the *Länder* for the Cities and Rural Areas (*Stadt und Land*) programme for investments in cycling

	2022	2023
Budget chapter and item:	1210 882 92	
Eligible expenditures:	€119.9 million	€269.2 million
GHG emission reduction:	1.275 million t CO_2e	2.861 million t CO_2e
Measures:	1,834	2,311
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations:
GHG reduction category: indirect (shift away from private motorised transport)
Value type: gross; before-after gross

Comments: The BMDV received scientific advice and guidance for the purposes of fine-tuning its Mobility and Fuels Strategy. This included a study that estimated the climate impacts of cycling infrastructure measures. Specifically, this study conducted an ex-ante impact assessment (not an evaluation) of (a) the shift to cycling as a mode of transport and (b) the (resulting) climate impacts (potential GHG reduction) attributable to BMDV financial assistance and funding programmes. To download the study, see the link below.

The pro rata amount of GHG savings for each reporting year was calculated on the basis of the ratio between (a) the funds actually disbursed during the respective reporting year and (b) total funding for the respective programme (this was the basis for calculating the estimated GHG reduction potential). The data provided here represents the cumulative amount of GHG savings that the funding disbursed in the respective year is expected to achieve by 2045. The values listed here are the ones derived from the *Fahrradland* ("cycling country") scenario. The study analyses various scenarios that differ in their assumptions with regard to aggregate economic trends and transport trends and the concomitant differences in mobility behaviour.

Links: https://bmdv.bund.de/SharedDocs/DE/Artikel/StV/Radverkehr/klimaschutz-im-verkehr.html

The federal government's special programme "Cities and Rural Areas" (*Stadt und Land*) provides the *Länder* with substantial financial assistance for investments in cycling infrastructure.

The aim is to make cycling safer and more attractive while promoting the development of cycling infrastructure throughout the country. To this end, financial assistance is provided to the *Länder*, local authorities and local authority associations for the construction, conversion and upgrading of extensive and preferably separated cycling networks, including off-carriageway cycle paths, cycle priority streets, cycle overpasses and underpasses, cycle stands and cycle garages. The special programme is implemented by the *Länder* on the basis of their own guidelines, criteria and priorities.

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2. International cooperation

In its international work, Germany is committed to sustainable development and places a particular priority on facilitating social and environmental transformations in developing and emerging countries. This cooperation is carried out in accordance with the United Nations' Sustainable Development Goals, the Paris Agreement and other relevant international agreements and initiatives. Germany supports its partner countries in building climate-friendly, resilient and inclusive economies. This requires not only a global transition to sustainable energy but also a shift from linear economies with conventional waste management policies to sustainable and fair circular systems.

Priorities and key outcomes of German development cooperation are described in the federal government's 17th Development Policy Report (*Entwicklungspolitischer Bericht*):[24]

A fair response to climate impacts

- The federal government advocates ambitious international support in responding to climate-related damages and losses. In this spirit, it has pledged to contribute USD 100 million to the newly created Fund for Responding to Loss and Damage (FRLD). The FRLD aims to enable people in particularly at-risk regions to respond quickly to future climate-related losses and damages caused by events such as droughts and floods.
- In particular, the federal government supports Small Island Developing States (SIDS) in their efforts to combat and adapt to climate change, implement sustainable nature and marine conservation measures, and manage climate and disaster risks.

Securing international financing for climate change mitigation and adaptation

- In 2023, Germany provided a total of €9.9 billion for climate change mitigation and adaptation measures in developing and emerging countries. Of this amount, €5.7 billion was allocated from the federal budget.
- As host of the second replenishment conference for the Green Climate Fund – the world's largest multilateral climate fund – Germany played a key role in placing the GCF on sound financial footing. At the conference, total pledges from all donors reached a record level of €12.8 billion for the period from 2024 to 2027.

The international cooperation sector's eligible expenditures in 2022 totalled €4,442.1 million and were distributed across 14 budget items. In 2023, the sector's eligible expenditures totalled €4,161.0 million and were distributed across 15 budget items. For both years, the budget items can be assigned to the following subsectors:

[24] https://www.bmz.de/resource/blob/238798/17-entwicklungspolitischer-bericht.pdf; Summary in English: https://www.bmz.de/resource/blob/246466/17-entwicklungspolitischer-bericht-kurzfassung-en.pdf

	2022		2023	
Subsector	Eligible expenditures (in € million)	Number of budget items	Eligible expenditures (in € million)	Number of budget items
Bilateral financial cooperation	1,323.9	3	1,235.1	3
Bilateral technical cooperation	828.9	1	861.6	1
International climate and environmental protection	763.7	4	804.2	4
Multilateral cooperation	804.4	2	853.5	2
Specific funding	721.2	4	406.6	5

2.1. Bilateral financial cooperation

2.1.1. Bilateral financial cooperation – loans

	2022	2023
Budget chapter and item:	2301 866 11	
Eligible expenditures:	€280.4 million	€167.3 million
GHG emission reduction:	Not available	Not available
Total number of projects:	63	70
Funding share:	See below	See below
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) e) f)	

Assumptions and limitations:
CO_2 impacts are scaled to eligible expenditures in 2022 and 2023; other indicators apply to the overall project; ex-ante estimates, internal BMZ calculations

Links: --

The eligible expenditures of bilateral financial cooperation loans are used to support Germany's development cooperation partner countries. These loans support projects that contribute to climate change adaptation and mitigation, environmental protection and resource conservation and/or biodiversity in countries with appropriate debt sustainability.

The expected impact is reported only for a selection of projects for which quantitative indicators can be estimated. The eligible expenditures of the project examples account for 27.7% of the eligible expenditures of the entire budget item in 2022, and 53.0% in 2023.

Project name (click on the project name to visit the website)	**Eligible expenditures (in € million)**	**GHG emission reduction (in t CO_2e p.a.)**	**Other indicators**
2022			
Renewable energy – solar power plant	28.7	29,519	Additional generation capacity provided (in MW): 37 Energy generated annually (in MWh): 66,419
Green bonds partnership facility – Peruvian funding window	16.0	Not available	Additional generation capacity provided (in MW): 3 Energy generated annually (in MWh): 13,760
Gulf of Suez wind farm	13.9	11,800	Additional generation capacity provided (in MW): 8 Energy generated annually (in MWh): 26,633
Energy for sustainable development: solar power plant for Côte d'Ivoire within the framework of the West African Power Pool (WAPP)	11.4	Not available	Additional generation capacity provided (in MW): 11 Energy generated annually (in MWh): 15,906 Number of people with access to energy: 22,222
EE refinancing from banks for Ukrainian businesses – German-Ukrainian Fund III	4.0	10,327	Not available
2023			
Efficient energy transmission II (renovation of transformer stations)	26.7	1,069	Amount of energy transmitted, distributed and transferred in MWh per year: 15
MSME credit line with green funding window	12.5	3,588	Not available
Renewable energy programme	3.1	Not available	Additional generation capacity provided (in MW): 3.2 Energy generated annually (in MWh): 4,439
Renewable energy – solar power plant	5.0	5,153	Additional generation capacity provided (in MW): 6.4 Energy generated annually (in MWh): 11,595
Gulf of Suez Wind Farm	25.1	21,309	Additional generation capacity provided (in MW): 18.7 Energy generated annually (in MWh): 47,740
Energy for sustainable development: solar power plant for Côte d'Ivoire within the framework of the West African Power Pool (WAPP)	11.4	Not available	Additional generation capacity provided (in MW): 10.8 Energy generated annually (in MWh): 15,837 Number of people with access to energy: 22,126

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2.1.2. Financial cooperation with regions

	2022	2023
Budget chapter and item:	2301 896 01	
Eligible expenditures:	€409.4 million	€162.1 million
GHG emission reduction:	Not available	Not available
Total number of projects:	20	17
Funding share:	See below	See below
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) e) f)	

Assumptions and limitations:
CO_2 impacts are scaled to eligible expenditures in 2022 and 2023; other indicators apply to the overall project; ex-ante estimates, internal BMZ calculations

Links: --

The eligible expenditures of bilateral financial cooperation with regions are used to finance regional approaches and to provide funding for regional stakeholders who have no partners with international legal capacity. The projects aim to contribute to climate change adaptation and mitigation, environmental protection and resource conservation and/or support for biodiversity in the regions.

The expected impact is reported only for a selection of projects for which quantitative indicators can be estimated. The eligible expenditures of the project examples account for 82.3% of the eligible expenditures of the entire budget item in 2022, and 76.2% in 2023.

Project name (click on the project name to visit the website)	**Eligible expenditures (in € million)**	**GHG emission reduction (in t CO_2e p.a.)**	**Other indicators**
2022			
PtX Development Fund II	249.9	79,999	Additional generation capacity provided (in MW): 75 Energy generated annually (in MWh): 259,998
Regional energy efficiency fund for the Western Balkans and neighbourhood regions (Green for Growth Fund X)	25.0	18,048	Energy savings (MWh per year): 224,217
eco.business Fund for Africa (EBFA) III	23.0	11,200	Not available
eco.business Fund for Latin America and the Caribbean IV: Tranche 6	15.0	17,774	Not available
Clean Energy and Energy Inclusion for Africa (CEI Africa) Foundation: Crowdlending / Smart Outcomes Fund	14.0	16,431	Additional generation capacity provided (in MW): 5 Energy generated annually (in MWh): 6,857 Number of people with access to energy: 100,857
Green bonds partnership facility – regional investment window, phase III	10.0	22,933	Not available
2023			
Regional energy efficiency fund for the Western Balkans and neighbourhood regions (Green for Growth Fund XI)	50.0	72,430	Energy savings (MWh per year): 277,757
Climate Transformation Fund Asia	39.0	136,950	Additional generation capacity provided (in MW): 24.9 Energy savings (MWh per year): 17,845
Climate Transformation Fund Asia II	19.0	38,986	Additional generation capacity provided (in MW): 7.4 Energy savings (MWh per year): 5,300
eco.business Fund for Latin America and the Caribbean IV: Tranche 7	12.0	9,341	Not available
Integrated Tiger Habitat Conservation Programme IV	0.4	Not available	Contribution to the preservation of conservation areas: 877,287 ha
Integrated Tiger Habitat Conservation Programme in Asia III	1.7	Not available	Contribution to the preservation of conservation areas: 1,498,536 ha

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2.1.3. Bilateral financial cooperation – grants

	2022	2023
Budget chapter and item:	2301 896 11	
Eligible expenditures:	€634.1 million	€905.7 million
GHG emission reduction:	Not available	Not available
Total number of projects:	459	481
Funding share:	See below	See below
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) e) f)	

Assumptions and limitations:
CO_2 impacts are scaled to eligible expenditures in 2022 and 2023; other indicators apply to the overall project; ex-ante estimates, internal BMZ calculations

Links: --

The eligible expenditures in bilateral financial cooperation are used to support Germany's development cooperation partner countries. The projects are intended to contribute to climate change adaptation and mitigation, environmental protection and resource conservation and/or support for biodiversity in the partner countries.

Due to the large number of projects, expected impacts can be reported only for selected projects. The eligible expenditures of the project examples account for 32.6% of the eligible expenditures of the entire budget item in 2022, and 25.9% in 2023.

Project name (click on the project name to visit the website)	**Eligible expenditures (in € million)**	**GHG emission reduction (in t CO_2e p.a.)**	**Other indicators**
2022			
Protected areas and biodiversity	4.4	Not available	Contribution to the preservation of conservation areas: 1,170,715 ha
Rehabilitation of the Inga II hydropower plant	3.0	Not available	Number of people with access to energy: 4,493
Sustainable management of the Selous game reserve	4.3	Not available	Contribution to the preservation of conservation areas: 7,682,303 ha
Malawi-Zambia Transfrontier Conservation Area	5.5	Not available	Contribution to the preservation of conservation areas: 2,665,641 ha
Promoting energy efficiency and energy access	3.0	Not available	Number of people with access to energy: 10,666
Programme for integrated national park management II	11.5	Not available	Contribution to the preservation of conservation areas: 16,021,531 ha
Hydropower in the Himalayas	2.6	5,067	Additional generation capacity provided (in MW): 2 Energy generated annually (in MWh): 7,554 Number of people with access to energy: 5,162
Sustainable hydropower I	3.0	1,149	Additional generation capacity provided (in MW): 2 Energy generated annually (in MWh): 22,655
Sustainable forest management programme in the Congo Basin: support for the BSB Yamoussa transboundary national park	2.0	3,242	Not available
West African Power Pool (WAPP) – Côte d'Ivoire-Liberia-Sierra Leone-Guinea (CLSG) II transmission line	5.6	Not available	Number of people with access to energy: 996
Rehabilitation of the Nangbeto hydropower plant within the framework of the West African Power Pool (WAPP) (Benin and Togo)	5.6	828	Additional generation capacity provided (in MW): 10 Energy generated annually (in MWh): 25,822
Reforestation / restoration of degraded areas	2.5	138	Not available
Renewable power transmission III	7.0	3,697	Energy savings (MWh per year): 35,896 Number of people with access to energy: 11,800
Green energy corridors IV - renewable power transmission	6.1	2,143	Energy savings (MWh per year): 12,693

Project name (click on the project name to visit the website)	**Eligible expenditures (in € million)**	**GHG emission reduction (in t CO_2e p.a.)**	**Other indicators**
West African Power Pool (WAPP) – Electrification and grid reinforcement along the CLSG transmission line in Monrovia	4.7	Not available	Number of people with access to energy: 20,067
Energy efficiency in connection with urban water supplies (network optimisation)	6.2	857	Not available
Electricidade de Moçambique (EDM) grid modernisation programme II	5.6	Not available	Energy savings (MWh per year): 111,624 Number of people with access to energy: 88,625
Renewable energy programme II	16.0	5,396	Additional generation capacity provided (in MW): 9
Biodiversity and sustainable forest management programme IV	3.0	Not available	Contribution to the preservation of conservation areas: 7,837,807 ha
Climate-friendly urban mobility V	7.1	4,494	Not available
Climate change mitigation in the water sector – energy efficiency and renewable energy V (German Climate Technology Initiative, DKTI)	4.7	638	Not available
Energy efficiency in the industrial sector	16.1	27,763	Energy savings (MWh per year): 64,208
Community energy in Zambia – promoting off-grid solutions in Zambia	2.1	671	Energy generated annually (in MWh): 941 Number of people with access to energy: 56,573
Climate change mitigation in the water sector – energy efficiency and renewable energy VI	5.2	724	Not available
Producing biogas from sewage sludge to optimise the energy balance (German Climate Technology Initiative)	5.7	793	Not available
Okapi Fund for Nature Conservation II	4.2	37,579	Contribution to the preservation of conservation areas: 1,189,060 ha
Green recovery programme in Central America	7.4	1,189	Not available
Municipal water infrastructure in Batumi (follow-up phase V)	2.0	278	Not available
Contribution to the Madagascar Protected Areas and Biodiversity Fund (FAPBM)	30.6	Not available	Contribution to the preservation of conservation areas: 6,052,878 ha
West African Savannah Foundation (WASF), Niger funding window	20.0	207,015	Contribution to the preservation of conservation areas: 222,018 ha

Project name (click on the project name to visit the website)	**Eligible expenditures (in € million)**	**GHG emission reduction (in t CO_2e p.a.)**	**Other indicators**
2023			
Preservation of Ivorian national parks (FPRCI funding window [Foundation for the Parks and Reserves of Côte D'Ivoire]), phase II	43.1	200,000	Contribution to the preservation of conservation areas: 1,677,447 ha
Okapi Fund for Nature Conservation III	15.0	44,000	Contribution to the preservation of conservation areas: 1,189,060 ha
More efficient energy transmission V (synchronising Ukraine's power grid with the EU's Continental Europe Synchronous Area) V (substitution of untied loan)	11.4	778	Energy savings (MWh per year): 1,292
UNDP – Improving energy security and promoting renewable energy in Lebanon	10.0	19,263	Energy generated annually (in MWh): 28,315 Energy savings (MWh per year): 4,474 Number of people with access to energy: 15,789
Sustainable energy supply for education and health in Afghanistan	9.0	1,950	Number of people with access to energy: 11,558
Supporting reforms in Jordan's water sector II (development policy loan)	9.0	5,592	Not available
Conservation and sustainable use of mountains and mountain ranges in Mexico	9.0	26,568	Contribution to the preservation of conservation areas: 830,038 ha
Indo-German green urban mobility partnership	8.9	5,779	Not available
India energy reform programme II	7.8	1,891	Not available
Indo-German green urban mobility partnership II	7.8	5,019	Not available
Indo-German solar energy partnership III	6.8	15,333	Additional generation capacity provided (in MW): 12.1 Energy generated annually (in MWh): 16,328
UNRWA: Stabilisation and basic services within the context of the Covid-19 pandemic	6.5	200	Not available
Programme to improve energy supplies in the African Great Lakes region, transmission line between Rwanda and DR Congo	5.5	Not available	New or modernised transmission and distribution lines (in km): 29 Number of people with access to energy: 9,820

Project name (click on the project name to visit the website)	**Eligible expenditures (in € million)**	**GHG emission reduction (in t CO_2e p.a.)**	**Other indicators**
India energy efficiency programme II	5.5	1,593	Additional generation capacity provided (in MW): 0.5 Energy savings (MWh per year): 109
Programme to reduce water loss (German Climate Technology Initiative)	5.5	893	Not available
Regional electricity transmission line between Mozambique and Malawi	5.4	Not available	New or modernised transmission and distribution lines (in km): 9 Amount of energy transmitted, distributed and transferred in MWh per year: 86,105
Regional programme to improve living conditions in Palestinian refugee camps (REPAC XI)	5.3	902	Additional generation capacity provided (in MW): 1
Sustainable resource management in Cameroon V	5.1	93,838	Contribution to the preservation of conservation areas: 277,747 ha
Climate-friendly electricity transmission and supply	5.0	1,332	New or modernised transmission and distribution lines (in km): 36
Promoting energy transition in the public sector (German Climate Technology Initiative)	4.6	523	Not available
Development Bank of Namibia: credit line for climate-related infrastructure projects II	4.5	7,044	Additional generation capacity provided (in MW): 3.7
Energy-efficient housing construction – phase III	4.4	107	Not available
Sustainable climate change mitigation – mobility	4.0	6,615	Not available
Sustainable financing for the national system of protected natural areas in Peru II	3.8	373,869	Contribution to the preservation of conservation areas: 9,238,156 ha
Olkaria I and IV upgrade	3.6	4,603	Additional generation capacity provided (in MW): 2.4
Sebzor hydropower plant – improving the water supply in the Gorno-Badakhshan autonomous region (German Climate Technology Initiative)	3.5	594	Additional generation capacity provided (in MW): 1 Energy generated annually (in MWh): 6,343 Number of people with access to energy: 9,118
Promoting competitiveness in rural areas	3.5	3,234	Not available

Project name (click on the project name to visit the website)	**Eligible expenditures (in € million)**	**GHG emission reduction (in t CO_2e p.a.)**	**Other indicators**
Electricidade de Moçambique (EDM) short-term investment plan – power transmission	3.3	Not available	Energy savings (MWh per year): 156,024 Number of people with access to energy: 1,101
Promoting social infrastructure (Ukrainian Social Investment Fund VIII)	2.9	209	Not available
Electricidade de Moçambique (EDM) grid modernisation programme II	2.8	Not available	Energy savings (MWh per year): 55,121 Number of people with access to energy: 43,764
Erosion control programme VI (PLAE)	2.7	35,303	Not available
Programme for sustainable and climate-friendly waste management (German Climate Technology Initiative)	2.6	3,156	Not available
Renewable energy programme operated by ESM (“Power plants of North Macedonia”) (German Climate Technology Initiative)	2.4	1,508	Additional generation capacity provided (in MW): 0.3 Energy generated annually (in MWh): 943 Energy savings (MWh per year): 62
Supporting the energy sector (phase VII) – improving the transmission network	2.3	420	Energy savings (MWh per year): 375 New or modernised transmission and distribution lines (in km): 4
Regional programme for efficient energy transmission II (IKLU)	2.3	2,278	Energy savings (MWh per year): 511 New or modernised transmission and distribution lines (in km): 4 Amount of energy transmitted, distributed and transferred in MWh per year: 64,828

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2.2. Bilateral technical cooperation

2.2.1. Bilateral technical cooperation

	2022	2023
Budget chapter and item:	2301 896 03	
Eligible expenditures:	€828.9 million	€861.6 million
GHG emission reduction:	Not available	Not available
Total number of projects:	708	735
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b)	e) f)
Assumptions and limitations: --		
Links: --		

The federal government supports the technical, economic and organisational knowledge and skills of people and organisations in partner countries through bilateral technical cooperation (TC). This helps them to meet national climate and environmental targets through the effective, efficient and sustainable use of resources. TC mainly consists of assistance and advice provided by experts (e.g. to government agencies or other organisations in the partner countries), funding for consultation services, and the limited provision and financing of materials and equipment. Most technical cooperation projects are implemented by the German development agency Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). Eligible expenditures contribute to climate change adaptation and mitigation, environmental protection and resource conservation and/or support for biodiversity. No aggregated data on the impacts of eligible expenditures is available.

The selected projects listed below (which account for about 2% of eligible expenditures) provide examples of impacts.

Project name (click on the project name to visit the website)	**Eligible expenditures (in € million)**		**Qualitative description of impacts**
	2022	**2023**	
WAP Region Transboundary Biosphere Reserve	4.16	2.01	The "WAP Region Transboundary Biosphere Reserve" project supported the protection and sustainable use of national parks and fragile ecosystems around the WAP region (W-Arly-Pendjari) in Niger, Burkina Faso and Benin. By the end of 2023, 663,710 local residents had received training that focused on environmental value chains. In addition, 83,428 hectares of wooded areas were reforested.
Governance and Sustainable Management of Natural Resources in the Comoé and Taï area, Côte d'Ivoire (Pro2GRN)	4.47	5.64	The "Governance and Sustainable Management of Natural Resources in the Comoé and Taï area" project provided capacity-building for Ivorian nature conservation authorities in order to improve management efficiency in Comoé National Park and Taï National Park. These measures helped to prevent deforestation and thus to avoid CO_2 emissions. The programme also aimed to improve the management of natural resources around Comoé National Park and increase the agricultural productivity of smallholdings. This included supporting the negotiation of 18 local agreements on the sustainable management of resources around Comoé National Park and helping 45,343 producers to increase their incomes by using sustainable farming methods in the cultivation of onions, rice and cashews. In addition, the introduction of an agroforestry system with acacia trees facilitated the regeneration of depleted soils. By the end of 2023, producers received support to establish 1,037 hectares of agroforestry plots in the Comoé region.
Renewable Energy and Energy Efficiency	2.88	1.41	The "Renewable Energy and Energy Efficiency" project collaborated with key government and industry stakeholders in Vietnam to create conditions that will boost renewable energy use and energy efficiency. This included supporting the introduction of a procedure to improve the data quality in annual energy reports issued by energy-intensive industrial companies. Those reports are subject to statutory audit requirements. In addition, three concepts for renewable energy awareness campaigns were developed for public institutions, and 191 employees at key energy companies attended renewable energy training seminars in 2022 (299 in 2023). By the end of 2023, the project generated additional energy savings at industrial companies in the amount of 128,719 MWh (electricity) and 4,342 MJ (biomass heating) per year.
Implementation-Oriented Environmental and Forest Management (ProAmbiente)	3.27	3.42	The "Implementation-Oriented Environmental and Forest Management (ProAmbiente)" project aimed to improve the conservation and the sustainable and legal use of biodiversity and tropical forests in Peru. With support from the project, the number of businesses in protected areas, buffer zones and adjacent lands that sell sustainably produced, biodiversity-based products increased from 32 to 58, 57% of which were managed by women or indigenous people. In addition, sustainability criteria for state-approved business plans were introduced. Also thanks to project support, two additional protected areas were being managed in line with the international Green List Standard by the end of 2022. Revenue from biodiversity-friendly products and tourism services marketed by small family farms and small farming enterprises using sustainability labels rose from PEN (Peruvian soles) 19,800 per year to PEN 183,834 per year. Furthermore, by the end of 2023, the area of natural forest managed by indigenous communities had grown from 1,223,444 hectares to 1,571,761 hectares.

Project name (click on the project name to visit the website)	**Eligible expenditures (in € million)**		**Qualitative description of impacts**
	2022	**2023**	
Strengthening Ecological Connectivity in the Taï-Grebo-Sapo Region	0.76	-	The "Strengthening Ecological Connectivity in the Taï–Grebo-Sapo Region" project supported state institutions and local actors in Côte d'Ivoire and Liberia to improve the connectivity and protect forest ecosystems in the Taï – Grebo-Krahn – Sapo border region. In this way, the project also facilitated the avoidance of CO_2 emissions. Within the context of the project, the Grebo-Krahn National Park's land use and management plan was endorsed by the local population and approved at the national level. 30 staff members from the Ivorian national park authority and the Liberian forest development authority received training in biodiversity management and conservation.
Promotion of Solar Water Pumps	0.85	-	The "Promotion of Solar Water Pumps" project expedited the adoption and the productive and sustainable use of decentralised renewable energy systems (especially solar water pumps) in India. This bilateral technical cooperation achieved its objectives on the basis of policy advisory, the development of financial products, and the digitalisation of the review process of the partner ministry's flagship programme "PM-KUSUM". The PM-KUSUM programme aimed to promote solar water pumps as a way to reduce the use of diesel in the agricultural sector. The digital review system – one of the programme's core components – helped to (a) ensure smooth processing and (b) provide a better understanding of the sector, which in turn boosted the deployment of solar water pumps. In 2022, the project indirectly avoided 76,065 t CO_2e in emissions.
Egyptian-German Joint Committee on Renewable Energy, Energy Efficiency and Environmental Protection	2.60	-	The "Egyptian-German Joint Committee on Renewable Energy, Energy Efficiency and Environmental Protection" project established an operational framework to reduce (a) the carbon intensity of Egypt's electricity supply and (b) electricity consumption. For example, geotechnical and topographic analyses facilitated the formulation of recommendations for new solar and wind farms. By the end of 2022, a total land area of around 800 km^2 had been analysed in terms of its usability for renewable energy projects, and findings showed that this area had the potential to generate up to 1.2 GW of wind power and 2.4 GWp of solar power.
Peatland and Wetland Rehabilitation and Management	-	0.71	By protecting natural habitats and promoting sustainable forest management, the "Peatland and Wetland Rehabilitation and Management" project improved the living conditions of poor rural communities in Indonesia. In addition, the avoidance of deforestation and forest degradation improved the greenhouse gas balance. By the end of 2023, the forest area under sustainable management by local communities increased from 91,771 hectares to 186,650 hectares.
Global programme "Energising Development" (ENDEV)	-	7.06	The "Energising Development" (ENDEV) global programme increased the number of poorer households, social facilities and micro, small and medium-sized enterprises (MSMEs) with access to needs-based, climate-friendly energy supplies in selected countries. In 2023, 2.9 million people, 2,390 social facilities, 1,340 schools, 210 health care facilities and 13,010 MSMEs gained easier access to modern energy technologies and services. As a result, emissions amounting to 2.91 million t CO_2e were avoided.

Project name (click on the project name to visit the website)	**Eligible expenditures (in € million)**		**Qualitative description of impacts**
	2022	**2023**	
Supporting the transformation of South Africa's energy sector (South African-German Energy Programme 4 [SAGEN 4])	-	3.20	The SAGEN 4 programme supported South Africa in meeting its energy and climate targets, particularly in terms of promoting renewable energy and improving energy efficiency. For example, an independent enterprise was set up and made ready for the purpose of operating the transmission network. By the end of 2023, six additional local authorities had established electricity consumption registers, and the connections of 5,033 additional decentralised renewable energy installations were registered with the distribution grid.

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2.3. International climate and environmental protection

2.3.1. International cooperation

	2022	2023
Budget chapter and item:	0903 532 45	
Eligible expenditures:	€23.1 million	€25.0 million
GHG emission reduction:	Not available	Not available
Projects:	44	44
Funding share:	Varied by project (usually 95%)	Varied by project (usually 95%)
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: The projects generally fund non-investment measures, and direct GHG emission reductions cannot be quantified.

Links:
https://www.euki.de/en/

The international climate action budget item provides funding for (a) climate action measures throughout the EU and worldwide and (b) mitigation projects in developing and emerging countries. Such measures and projects contribute to the implementation of the Paris Agreement. This budget item is not limited to specific instruments. Due to the large number and heterogeneity of the projects, it is not possible to aggregate at budget item level.

The European Climate Initiative (EUKI)

Launched in 2017, the European Climate Initiative supports climate action and knowledge transfer, primarily in Eastern and Southern Europe. EUKI funding measures focus on non-investment climate action projects. The objectives of EUKI are:

(a) Strengthening knowledge and awareness-raising of the drivers of climate change and of the environmental, social and economic opportunities arising from climate action

(b) Promoting the sharing of good practices, intensifying the transfer of knowledge and experience, and creating networks to support transformative processes and favourable conditions for reducing greenhouse gas emissions

(c) Strengthening European integration by forging better connections between stakeholders, which in turn reflects and supports European climate policy

From the annual calls for project ideas that were held from 2017 to 2023, a total of 203 projects were selected for funding. Over 40 additional projects received direct funding from the responsible ministry. One project example is Young Energy Europe 2.0, which since 2021 has been training young professionals in eight European countries to become “Energy Scouts”. Energy Scouts learn to identify and leverage potential energy savings in their companies. On average, each Energy Scout identifies potential energy savings and emissions reductions totalling 152 MWh of electricity and 155 tonnes of CO_2 per year.

Carbon market mechanisms

The main purpose of the carbon market under the Paris Agreement is to make nationally determined contributions (NDCs) more ambitious. One of the Paris Agreement’s

objectives (set out in Article 2.1(c)) is to make finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development. In support of this objective, funded international activities are geared towards leveraging various financial incentives, regulatory frameworks and alliances e.g. through carbon pricing, climate finance and phasing out fossil fuel financing. Measures also aim to secure Germany's position as a leading player (a) in aligning financial flows with the objectives of the Paris Agreement and (b) in the international carbon market at the interface between business, science, politics and public administration.

Example project: Technical support for the strategic dialogue of the Carbon Market Platform

From 2016 to 2021, the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) provided the OECD with funding to set up a Carbon Market Platform. The platform aims to provide a forum for international cooperation to support the UNFCCC process in establishing a framework for using carbon markets, thereby making strategic progress in developing, harmonising and potentially linking carbon markets. In addition, the platform aims to pool various climate policy measures and approaches, to identify new areas for cooperation, and to support the achievement of climate targets within the UN climate process. In its initial phase, the platform focused on aspects of carbon markets that are affected by the rules contained in the Paris Agreement. These aspects gained increasing specificity as the platform continued its work. In general, the platform is meant to support the UNFCCC process without duplicating established UN negotiating structures. In its second phase, the platform provided more in-depth support to countries and regions that had already been analysed, established strong regional synergies, and expanded the project to further countries and regions. Against this background, the platform's central goal is to increase its members' knowledge and understanding of selected key topics and to impart its findings to a broader number of OECD countries, by providing technical support. In 2022, the platform focused on the role of carbon pricing in facilitating transformative change.

Example project: Expanding the Carbon Credit Quality Initiative to include jurisdictional REDD+

The Carbon Credit Quality Initiative (CCQI) was launched in 2021 by the Environmental Defense Fund (EDF), the World Wildlife Fund (WWF-US) and the Öko-Institut. The CCQI aims to provide market participants with transparent information on the quality of carbon credits. During the initiative's initial phase, the participating organisations developed a methodology for assessing various quality factors on the basis of a catalogue of criteria. The Öko-Institut then applied this methodology to various certification standards and project types during various project stages. Financing was provided by WWF-US and EDF. Findings are published on the CCQI's website. In this way, options for improving certification standards are made available to the public, and potential carbon credit buyers gain a better understanding of the market.

So far, the following nine project types have been evaluated: efficient cookstoves, establishment of natural forests, household biodigesters, industrial biodigesters fed with livestock manure, landfill gas utilisation, leak repair in natural gas transmission and distribution systems, recovery of associated gas from oil fields, solar photovoltaic power, and onshore wind power.

In addition, the CCQI plans to analyse the relevant quality characteristics of carbon credits for the forestry sector (known as "jurisdictional REDD+") in order to provide participants on international carbon markets with easy-to-understand information on potential quality risks and strengths. Findings will be published on the CCQI's website, thereby providing information on a new project type that is highly relevant for the carbon market.

Measures to create an international carbon market

Germany is committed to further developing emissions trading as a key climate action instrument. To this end, it is taking initiatives to support the development of emissions trading systems and enable their possible future linking. In fiscal years 2022 and 2023, the government provided funding for the secretariat of the International Carbon Action Partnership (ICAP). Germany established the ICAP in 2007 as an initiative to align and link the EU Emissions Trading System with other systems. The government also pursues bilateral activities with various countries with the aim of implementing emissions trading. Again in 2022 and 2023, ICAP published its annual Status Report on emissions trading systems around the world. The report is a highly regarded source of information for international experts.

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2.3.2. Investments to protect the climate and biodiversity abroad

	2022	2023
Budget chapter and item:	0903 896 41	
Eligible expenditures:	€671.7 million	€699.0 million
GHG emission reduction:	8.21 million t CO_2e (30 International Climate Initiative projects)	8.76 million t CO_2e (23 International Climate Initiative projects)
Land area with improved ecosystems:	26.44 million ha (58 International Climate Initiative projects)	19.41 million ha (53 International Climate Initiative projects)
Number of persons receiving support:	605,656 (67 International Climate Initiative projects)	863,252 (64 International Climate Initiative projects)
Projects funded (by reporting year):	417	374
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b)	e) f)

Assumptions and limitations:

- The quantitative impact data reported here does not refer to a specific year (except for the number of funded projects) but rather to the cumulative impacts achieved during the elapsed duration of the respective multi-year project (here, including the reporting years 2022 and 2023, respectively). The data refers to all International Climate Initiative projects that were being implemented in the respective reporting year. Aggregating data from multiple Impact Reports (here, the reports for 2023 and 2024) leads to double-counting and should be avoided.
- Projects that have achieved plausible GHG reduction effects account for only a small part of the International Climate Initiative's portfolio. Disbursements to 30 projects in 2022 accounted for only 4.34% of eligible expenditures. Disbursements to 23 projects in 2023 accounted for only 3.14% of eligible expenditures. The disbursements in 2022 accounted for 12.4% of total funding for the 30 multi-year projects with reduction impacts. The disbursements in 2023 accounted for 12.54% of total funding for the 23 multi-year projects with reduction impacts.
- The GHG reduction figures refer exclusively to mitigation effects obtained during the project period (ex-post). They do not include projected savings generated by, for example, the ongoing use of new technologies.

The three indicators reflect impacts that are the result of project measures. The figures do not include additional impacts through activities such as capacity-building or policy advice, although these are widely used approaches in the International Climate Initiative's portfolio.

Links:

Further information on the International Climate Initiative: https://www.international-climate-initiative.com/en/about-iki/

Information on the International Climate Initiative's standard indicators, along with figures from evaluations (including completed projects): https://www.international-climate-initiative.com/en/about-iki/impact-and-learning/

The International Climate Initiative (IKI) funds a wide variety of projects that help developing and emerging countries to reduce greenhouse gas emissions in all kinds of sectors (funding area I), adapt to the consequences of climate change (funding area II), preserve natural carbon sinks such as forests and peatlands (funding area III) and protect or restore ecosystems and biodiversity (funding area IV).

A large variety of approaches to climate action and biodiversity conservation are applied in the project portfolio. For example, International Climate Initiative projects advise policymakers, authorities and the private sector on the development of strategies, action plans and laws at all levels (from small villages to metropolitan regions right up to the multilateral level), provide capacity-building, and develop financing instruments. Quantifiable impacts for the above three standard indicators will not materialise until these plans and instruments have been implemented. As this usually occurs after project completion, these impacts are not included in assessments of the direct of International Climate Initiative projects.

Many projects therefore aim to improve political and regulatory frameworks and to overcome structural and investment barriers. In this way, they help partner countries to independently adopt and sustainably pursue climate-friendly and biodiversity-friendly development paths. While impacts of such projects cannot usually be measured in terms of indicators such as land area with improved ecosystems during their lifetime, they act as key drivers of (a) large-scale and measurable effects with regard to climate change mitigation and biodiversity conservation and (b) further investments in areas such as GHG-mitigating infrastructure in the longer term (after project completion). Post-project follow-up effects can no longer be quantified and counted as eligible within the framework of the International Climate Initiative (and are therefore not included in the above indicators).

The following projects provide insights into the various approaches and impact pathways that are used by International Climate Initiative projects and that cannot be mapped by the above indicators.

Project name	Eligible expenditures (in € million) 2022	2023	Countries	Qualitative description of impacts
Clean, affordable and secure energy for Southeast Asia (CASE)	3.8	5.5	Indonesia, Philippines, Thailand and Vietnam	The project aims to promote evidence-based energy transitions and ambitious climate targets in the region. To this end, it develops evidence-based solutions to energy challenges with broad stakeholder involvement, builds up a knowledge platform, participates in the Southeast Asia Energy Transition Partnership and provides technical and policy support.
Linking market mechanisms and climate finance in Africa	0.55	0.62	Ethiopia, Senegal and Uganda	The project promotes the use of financing mechanisms for climate change mitigation and adaptation in implementing countries. To this end, it pilots climate financing models in partner countries that contribute to their NDCs. It also assists governments and the private sector in formulating climate financing proposals. Project findings feed into climate negotiations and the public debate, thus helping to shape policy instruments.
Climate Action Tracker	0.88	0.92	-	The Climate Action Tracker aims to provide relevant stakeholders with information on the adequacy of national mitigation activities that are designed to meet long-term goals, thereby helping them to contribute to the achievement of ambitious climate targets. To this end, it conducts regular, transparent and independent investigations and assessments of the national and global implementation of the Paris Agreement in around 40 countries that account for over 85% of global emissions.
Climate-friendly technologies and capacity development for the implementation of the Brazilian national waste policy	0.46	0.12	Brazil	The project aims to improve the conditions for a climate-friendly and resource-efficient circular economy in Brazil. This includes integrating climate-relevant criteria into rules, regulations and laws, carrying out wide-ranging capacity-building measures for various target groups and assisting with the introduction of climate-friendly waste management measures in courses of study.
Supporting the design and initial implementation of the new global framework for biological diversity	1.6	1.5	Costa Rica, Indonesia and South Africa	The project supports partner countries in the design and initial implementation of the new global framework for biological diversity beyond 2020. To this end, it assists project partners in preparing for CBD COP 15, promotes integrated approaches to biodiversity and climate change, and identifies funding instruments to implement the goals of the new biodiversity framework. It also advises on issues such as nature-based solutions for climate action and biodiversity conservation.

Project name	Eligible expenditures (in € million) 2022	2023	Countries	Qualitative description of impacts
Western Africa alliance on carbon markets and climate finance	0.79	0.35	Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo	The project aims to strengthen sub-regional cooperation within the West African Alliance on Carbon Markets and Climate Finance and to improve countries' resources and capabilities for implementing Article 6 of the Paris Agreement. Member participation in international negotiations on Article 6 ensures that African priorities are taken into account in the design of new carbon market approaches. In addition, a platform for networking between strategic partners (such as financiers and project developers) supports the launch of carbon market projects. The development of institutionalised regional cooperation structures will raise awareness, promote knowledge transfer and encourage replication within the region.
Transparent policymaking: the Caribbean Cooperative MRV Hub (CCMRVH)	0.62	0.43	Caribbean small island developing states	The CCMRVH assists Caribbean countries in developing and using measurement, reporting and verification (MRV) systems that can collect and process data, compile greenhouse gas inventories, model climate policies and track progress towards national climate goals. It offers a wide range of capacity-building and support measures for this purpose. The aim is to build national expertise, make MRV systems more efficient and reduce dependence on outside experts.
RESTORE+: addressing landscape restoration on degraded land in Indonesia and Brazil	0.75	0.17	Indonesia and Brazil	The project supports land-use monitoring, degradation monitoring, modelling, policymaking and land-use planning for degraded landscapes in Brazil and Indonesia. In Indonesia, it combines mapping campaigns (in collaboration with the local population) with land-use and supply chain modelling. This enables the project to identify areas suitable for restoration while analysing the impacts on production, biodiversity, GHG emissions and society. In Brazil, it supports existing land monitoring and modelling technologies and the implementation of the Bonn Challenge.
Promoting long-term defossilisation pathways through Power-to-X (PtX Pathways)	1.8	3.6	Argentina, Morocco and South Africa	PtX Pathways supports the development of sustainable Power-to-X and hydrogen markets in Morocco, South Africa and Argentina as a building block for their energy transition. The project supports the relevant ministries for energy and the economy in developing PtX allocation scenarios, including the analysis of value chains. Working jointly with the partners, the team identifies business development opportunities and derives recommendations for improving regulatory frameworks for PtX. In Morocco, a power-to-liquid pilot plant demonstrates the entire PtX value chain, paving the way for upscaling and capacity development. Good practices, tools and guidelines are disseminated to other

Project name	Eligible expenditures (in € million) 2022	2023	Countries	Qualitative description of impacts
				countries via the International PtX Hub, thereby contributing to the PtX debate in other markets.
Establishing sustainable consumption and production – a south-south transfer ("SCP South-South")	0.69	0.78	Indonesia, Colombia, Paraguay, Philippines and Thailand	The project promotes sustainable consumption and production methods by implementing various measures and strategies. Among other things, it supports national governments in developing mitigation strategies in the agri-food sector, promotes the implementation of sustainable business models and uses information campaigns to raise awareness about sustainable approaches to production and consumption.

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2.3.3. International environmental protection – export of technologies to tackle marine litter

	2022	2023
Budget chapter and item:	1601 687 06	
Eligible expenditures:	€13.7 million	€24.5 million
GHG emission reduction:	Pursues other objectives	Pursues other objectives
Projects:	16	16
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	c) d) e) f)	c) d)

Assumptions and limitations: --

Links: https://www.z-u-g.org/en/marine-litter/

The oceans are important ecosystems for countless animal species and a vital natural resource for humans. Every year, approximately 13 million tonnes of plastic waste is washed into the oceans. As a result, marine animals mistake plastic debris for food or become entangled in it and die. In addition, plastics ingested by animals can reach humans through the food chain.

With the "Marine Debris Framework – Regional Hubs around the Globe" (Marine:DeFRAG) funding programme, the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) supports international projects that help to collect plastic debris at source or prevent it from entering the oceans.

Funding is provided both for activities to reduce the amount of plastic waste in the medium term and for activities to establish and develop effective waste and recycling management systems in the short term. In addition to countries and regions along rivers that transport plastic waste from inland areas to the sea, the project also focuses on coastal regions and island nations.

Example projects from the programme to fight marine litter:

Project name	Eligible expenditures (in € million) 2022	2023	Duration	Description
SCIP Plastics: sustainable capacity-building to reduce irreversible pollution by plastics	0.7	1.2	2021–2025	The project's overarching objective is to establish a knowledge transfer hub at the Khulna University of Engineering and Technology, with a focus on minimising and preventing marine plastic pollution in the Bay of Bengal. Due to its attributes, Bangladesh is one of the world's ten leading countries in terms of marine plastic pollution. In the absence of countermeasures, the country's plastic pollution is expected to worsen. The knowledge transfer hub pools expertise in the areas of plastics avoidance/substitution and recycling management, develops sustainability guidelines and offers science-based policy advice. Interdisciplinary stakeholders from the private sector, government and civil society are developing a master plan to reorganise the city of Khulna's waste management system, taking the informal sector into account. To this end, the disposal chain (decentralised collection, recycling centres, landfill sites) is evaluated from a socioeconomic perspective, and stakeholders are informed about measures via the project's Awareness Centre. Ports are being studied as point sources (test case: Mongla Port) with the aim of identifying ways to replicate findings at the national level.
PROCEP: protecting Mexico's coastal regions and marine ecosystems by reducing plastic waste	0.9	1.6	2021–2026	The project is taking targeted measures in three coastal areas in the state of Oaxaca, with the aim of reducing the amount of plastics that enter marine ecosystems on the Pacific coast of Mexico. Furthermore, by transferring best practices to other Mexican coastal regions and integrating its findings into national environmental policies, the project aims to facilitate the medium- and long-term reduction of marine litter in the seas of Mexico. The project uses waste flow diagrams (WFDs) and third-party data to estimate the amount of plastic waste that enters the sea. On this basis, it is possible to generate more precise data on the amount of plastic waste that can be prevented by the project and/or from entering the sea. In general, data on marine litter remains quite limited. There is very little data on plastic waste in the communities along Mexico's Pacific coast and the Isthmus of Tehuantepec. For this reason, it is necessary to conduct field studies in order to make more precise estimates. Moreover, the data must be reviewed because the Covid-19 pandemic may have altered the data situation.
Waste Wise Cities Lebanon: reducing marine litter in the	0	2.3	2022–2025	The project's objective is to assist Lebanese cities and communities in laying the groundwork for sustainable waste management systems and in this way to improve the recovery of materials and resources, reduce pollution (especially marine litter) and promote political stability.

Project name	Eligible expenditures (in € million)		Duration	Description
	2022	2023		
Mediterranean Sea (LIB_ReMaL)				
Prevention, reduction and recycling of fishnet pollution in Vietnamese coastal waters (REFVIN)	0	0.7	2022–2025	Working within a network of small and medium-sized fishing operations, universities and regional fisheries authorities, the project aims to reduce marine litter caused by lost and discarded fishing nets in Vietnamese coastal waters. The project conducts capacity-building at universities in order to facilitate the identification and definition of recycling pathways and new value chains. Empirical studies are conducted to identify and quantify sources of plastic emissions from fishing. Plastics and fishing net materials from various use phases are analysed. The development of best practice guidelines for reusing and recycling fishing gear helps small and medium-sized fishing operations to run their businesses more sustainably. Advisory services for policymakers and assessments of technological ideas and options help to build policymaking capacities for the purpose of developing policy frameworks to prevent marine litter from fishing gear. Demonstration centres for plastics recycling are set up to raise public awareness of environmental issues.
Marine litter prevention through the reduction, sustainable design and recycling of plastic packaging (MA-RE Design)	0	1.7	2022–2026	The project helps to reduce the amount of plastic leakage into the sea. It links local, national and regional activities and conducts capacity-building among key partners along the entire plastics value chain (including the private sector), with the aim of reducing plastic waste and improving its recovery and reuse. This provides long-term benefits for policymakers, key stakeholders and the general public in Thailand and beyond. At the national level, the project focuses on strategies to (a) avoid and reduce single-use plastic packaging and (b) improve plastic waste management, for example by introducing extended producer responsibility (EPR) schemes. Local activities focus on the reduction of plastic waste in two communities that are located near biodiversity hotspots and that can serve as replicable examples for other regions. Knowledge-sharing with other Asian countries promotes a coherent regional approach.
Clean Caribbean: an integrated, public-private approach to reduce marine litter on the	0	0.2	2023–2027	The Clean Caribbean project aims to reduce plastic waste input into the Caribbean Sea along the coasts of Guatemala and Honduras by (a) motivating end-consumers to manage waste responsibly at source, (b) integrating the private sector into the circular economy, (c) creating favourable conditions for extended producer responsibility (EPR) schemes and

Project name	Eligible expenditures (in € million)		Duration	Description
	2022	2023		
Caribbean coast of Guatemala and Honduras				(d) helping city governments to build greater capacity for effective solid waste management. It is being implemented in eight cities along the Motagua, Chamelecon and Ulua rivers, which carry huge volumes of solid waste into the ocean. The project addresses the problems of deficient solid waste management and excessive dependence on single-use plastic packaging. It pursues similar approaches in both Guatemala and Honduras by bringing together national and local government authorities, private sector actors and at least 300,000 end-consumers to develop viable and integrated solutions that reduce the generation of solid waste.
MarLi: reliable waste management and waste mitigation on the coast of Ecuador	0	0.9	2023–2027	The comprehensive project strategy to combat marine pollution in Ecuador focuses on improving waste management, eliminating single-use plastic and reducing discarded fishing gear. The main objectives are to strengthen capacities at the national and local level, promote circular economy principles and support research and citizen science projects. The project aims to help Ecuador tackle the problem by strengthening the capacities of national institutions and local governments, thereby boosting the efficiency of waste management systems. This includes enacting local regulations to eliminate single-use plastics and reduce waste streams in coastal and marine ecosystems. The project engages in close cooperation with partners from the private sector and the research community to develop options for preventing plastic waste. In addition, the project plans to support joint research and monitoring activities to prevent marine litter, thereby improving coordination among all stakeholders. An extension of the project to the Galapagos Islands is being considered.

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2.3.4. International climate and environmental protection

	2022	2023
Budget chapter and item:	2310 687 01	
Eligible expenditures:	€55.2 million	€55.7 million
GHG emission reduction:	Not available	Not available
Projects:	73	74
Funding share:	See below	See below
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b)	

Assumptions and limitations: --

Links: See the list of project examples.

The International Climate and Environmental Protection budget item funds new and particularly innovative climate change mitigation and adaptation approaches that contribute to the implementation of the Paris Agreement in developing and emerging countries. The budget item is not limited to specific instruments. Funding can be provided to projects carried out by international organisations, GIZ, KfW, churches, political foundations, local authorities and researchers.

Due to the large number and heterogeneity of the projects, it is not possible to provide aggregate information on impact indicators at budget item level. Descriptions of impacts are provided below for selected projects that account for about 47% of eligible expenditures in 2022 and about 29% of eligible expenditures in 2023.

Project name (click on the project name to visit the website)	**Eligible expenditures (in € million)**	**Description**
2022		
IMF: Climate Change Capacity Development Programme	1.996	This programme aims to mainstream climate policy within the IMF's work and to build capacities for the formulation and implementation of climate action policies in emerging and developing countries. To this end, finance ministries and central banks in particular receive support in the form of advice on tax policy, infrastructure management and the integration of climate risks into fiscal policy.
UNDP: Climate Promise – From Pledge to Impact	17.0	This multi-donor programme assists countries in formulating and implementing their nationally determined contributions (NDCs). NDCs are national targets for reducing greenhouse gas emissions and adapting to climate change. They are a core component of the Paris Agreement. By providing targeted support for the establishment and implementation of national, regional and global implementation frameworks and aligning its own portfolio with the NDCs, Climate Promise makes a decisive contribution to the implementation of the Paris Agreement.
UN-Habitat: Just transitions in vulnerable places: digital solutions for more climate-resilient informal settlements and for climate-smart urban recovery in crisis-affected communities	1.5	This project supports Ukrainian cities and national and subnational partners in Namibia in their efforts to address the social, environmental, economic and political challenges arising from rapid urbanisation and military conflicts. The urban recovery schemes are long-term and "climate-smart". Specifically, the project provides assistance in gaining access to relevant data and using this data to develop targeted solutions.
UNEP: e-mobility as a driver for change: towards a gender transformative and just transition to electric mobility	0.5	The project aims to ensure that, during the process of introducing and switching to electric mobility in low- and middle-income countries, the positions and interests of women are taken into account and supported in order to create more gender-equitable and gender-transformative transport sectors. To this end, databases are built and tools are developed. These are then applied and replicated in cooperation with partners. Support will be provided to up to 2,000 female decision-makers, and up to 1,000 women will receive technical training.
IISD: Climate-friendly investments to support a green and sustainable transformation of the transport sector	0.5	The project provides partner countries with support in designing transport sector stimulus programmes in a way that promotes "green recovery" – that is, with verifiable, long-term positive impacts in terms of economic development, emissions reductions, the environment and social cohesion. During the preparatory phase in 2022, activities included primarily capacity building, data improvement and regional networking and dissemination of sustainable transport concepts. In 2023 and 2024, nine detailed reports using the Sustainable Asset Valuation (SAVi) method were published. These reports are targeted towards cities, metropolitan regions and national transport plans. They aim to show that the higher costs of sustainable mobility strategies (including nature-based approaches) pay off in the long run when they are assessed from a macroeconomic perspective that takes all social costs into consideration.

Project name (click on the project name to visit the website)	Eligible expenditures (in € million)	Description
World Bank: PPIAF contribution to the G7 Partnership for Global Infrastructure and Investment	3.0	The contribution by the Public-Private Infrastructure Advisory Facility (PPIAF) aims to improve the conditions for broad-impact, sustainable private sector investment in developing and emerging countries. The initiative's objective is to increase the availability of climate-friendly, robust, affordable and inclusive infrastructural services by improving the conditions for private sector involvement in various developing and emerging countries.
WWF: Save our Mangroves Now!	1.25	This is an initiative that, since 2017, has been mobilising political decision-makers and supporting other actors in their efforts to curb and reverse the loss of mangroves, both globally and with a specific focus on the Western Indian Ocean. Through the end of 2022, partner organisations supported activities including the formulation of ambitious international targets for effective mangrove restoration, the launch of the Global Mangrove Breakthrough (at UNFCCC COP27) and the inclusion of mangroves in the NDCs of Madagascar, Tanzania, Kenya and Mozambique.
2023		
IISD: The NAP Global Network – expediting the implementation of National Adaptation Plans	1.75	The NAP Global Network works together with the International Institute for Sustainable Development (IISD) to help developing countries make the transition from planning adaptation measures to implementing them. A particular focus is placed on effectiveness, equity and establishing links to global discussions on adaptation.
Germanwatch: Improving the Paris alignment of multilateral development banks II	0.75	Through this project, Germany supports a consortium of think tanks with the aim of providing multilateral development banks (MDBs) with critical, constructive guidance in aligning their portfolios with the goals of the Paris Agreement. Financing was provided for research projects on methodological alignment with the Paris Agreement, for capacity-building, and for advocacy at MDBs and other stakeholders.
UNFCCC: Supporting the Transitional Committee on Loss and Damage	1.5	The Transitional Committee (TC) on Loss and Damage was established at COP27. Its objective was to make recommendations on the operationalisation of new funding arrangements. This funding was used to (a) conduct a TC session and a workshop (planning, organisation, follow-up work), (b) commission studies and background papers by consultants, (c) support the TC's intersessional work and (d) increase the participation of stakeholders outside the TC.
WWF: Multi-actor partnerships for 100% renewable energy (100% RE MAP)	0.36	The project aims to secure the long-term commitment of key interest groups in Nepal, Uganda and Vietnam for the purpose of implementing the "100% renewable energy for all" strategy and forging close links with the Agenda 2030. Within the space of a year, these three countries have set up well-functioning multi-actor partnerships that have prepared and adopted technical scenarios for implementing policy roadmaps.
World Resources Institute Climate Program: helping countries achieve socially equitable transitions	1.4	The project supports partner countries in their efforts to improve and implement national climate plans (NDCs and LT-LEDS), meet climate targets and promote equitable transformations. This encompasses a wide range of activities at the national level that aim in particular to integrate gender issues, promote youth inclusion and carry

Project name (click on the project name to visit the website)	Eligible expenditures (in € million)	Description
through the implementation of NDCs and LT-LEDS		out vulnerability assessments. In addition, the project promotes capacity-building, peer-to-peer communication and the development of multilateral guidelines in order to improve the design and facilitate the effective implementation of climate plans.
KfW: Blue Action Fund (BAF)	8.0	By the end of 2023, the Blue Action Fund's total portfolio amounted to €143.44 million. The broad impacts of its 28 funded projects (three of which have been concluded) are spread across 191 locations that cover an extensive range of territory. By the end of 2023, the fund's activities had improved marine protection in an area covering approximately 380,693 km² (aggregate area with no overlap). Funded projects support the effective management of marine protected areas covering 232,182 km², with new protected areas added regularly.
WWF: Save our Mangroves Now!	1.0	This is an initiative that, since 2017, has been mobilising political decision-makers and supporting other actors in their efforts to curb and reverse the loss of mangroves, both globally and with a specific focus on the Western Indian Ocean. Through the end of 2023, the initiative supported policymaking processes to improve mangrove protection in Kenya and Mozambique, facilitated the establishment of a Mangrove Restoration Accelerator Hub in Mozambique, and contributed to the achievement of the Global Mangrove Breakthrough's objectives.
UNEP: Biodiversity Finance Action Plan Generation Restoration	1.3	The project runs from 2023 to 2025. In 2023, pilot projects using urban nature-based solutions (NbS) were launched in eight cities around the world. In addition, a business incubator for start-ups in the ecosystem restoration sector was launched in Brazil. The project also helped raise global awareness of the importance of nature-based solutions by publishing a report on the financing of flagship projects and by preparing a report on how nature-based solutions can create jobs.

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2.4. Multilateral cooperation

2.4.1. Contributions to international organisations

	2022	2023
Budget chapter and item:	1601 687 01	
Eligible expenditures:	€18.0 million	€18.2 million
GHG emission reduction:	Not available	Not available
Funded institutions:	32	32
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) c) d) e) f)	
Assumptions and limitations: --		
Links: --		

Environmental protection, climate action and nature conservation must be globally successful in order to achieve the Sustainable Development Goals (SDGs). Effective organisations are needed to implement, monitor and further develop international agreements on environmental protection and nature conservation. The federal government makes annual contributions to support these organisations.

Montreal Protocol on Substances that Deplete the Ozone Layer

The Montreal Protocol of 1987 sets out a precise timetable for the global phase-out of the production and use of substances that destroy our ozone layer, such as CFCs. Since 16 September 2009, the Montreal Protocol is one of the first two agreements in the history of the United Nations to be ratified by all states in the world. The results of the agreed goals are clearly visible: worldwide, the quantities of ozone-depleting substances being produced and consumed fell drastically in just a few years. At the same time, the agreements under the Montreal Protocol prevented an additional increase in greenhouse gas emissions.

Other international organisations receiving support from the BMUV in 2022 and 2023 include:

- Permanent Secretariat of the International Commission for the Protection of the Rhine
- Permanent Secretariat of the International Commission for the Protection of the Saar and the Moselle
- Protocol on Further Reduction of Sulphur Emissions (Oslo) (1994)
- International Council for the Exploration of the Sea (ICES)
- Permanent Secretariat of the International Commission for the Protection of the Meuse
- Permanent Secretariat of the Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area
- Permanent Secretariat of the International Commission for the Protection of the Elbe
- Permanent Secretariat of the International Commission for the Protection of the Oder

- Basel Convention (Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal)
- Permanent Secretariat of the International Commission for the Protection of the Danube River
- Strategic Approach to International Chemical Management (SAICM)
- United Nations Environment Fund
- UNEP/UNESCO/BMU Education Programme
- World Health Organisation (WHO)
- Vienna Convention for the Protection of the Ozone Layer
- Secretariat of the Cooperation Plan for the Implementation of Regional Sustainable Development at the Council of the Baltic Sea States (Baltic 21)
- Alpine Convention Secretariat (Protection and Sustainable Development of the Alps)
- Stockholm Convention (prohibition and restriction measures for certain persistent organic pollutants)
- Rotterdam Convention (prior informed consent procedure for certain hazardous chemicals; pesticides in international trade)
- International Panel for Sustainable Resource Management (International Panel on Resources)
- Transfer of funding for the UNEP Life Cycle Initiative
- Minamata Convention on the Control of Mercury
- United Nations Economic Commission for Europe (UNECE)
- OECD Programme on Chemical Safety and Biosafety
- WHO environmental and health projects
- OECD GREEN Action Task Force for Central and Eastern Europe
- Special Programme (Chemicals and Waste Management Programme)
- Contribution to the Protocol on Pollutant Release and Transfer Registers (PRTR Protocol)
- Contribution to the EU Aerosol, Clouds, and Trace Gases Research Infrastructure (ACTRIS)
- Circular & Fair ICT Pact (CFIT)
- United Nations Institute for Training and Research (UNITAR)
- Secretariat of the Geneva Convention on Long-Range Transboundary Air Pollution

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2.4.2. Developmentally important multilateral aid for global environmental protection, biodiversity conservation and climate protection

	2022	2023
Budget chapter and item:	2303 896 09	
Eligible expenditures:	€786.4 million	€835.3 million
GHG emission reduction:	Not available	Not available
Number of supported international initiatives:	13	16
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b)	f)

Assumptions and limitations: Outcomes of funding provided by the institutions listed below are not recorded on a provider-specific basis. The contributions are made under international agreements. There are various beneficiaries with differing tasks and objectives. The outcomes cannot be aggregated.

Links: --

Multilateral organisations implement large-scale, broad-impact programmes in developing and emerging countries and coordinate the related financial contributions from various donors. They play an important role in supporting transformation processes in the partner countries. Germany contributed to 13 multilateral initiatives in 2022 and 16 multilateral initiatives in 2023. Quantitative impact indicators are either unavailable or have limited informational value. Therefore, each initiative is described in qualitative terms.

Project name (click on the project name to visit the website)	**Eligible expenditures (in € million)**		**Qualitative description of impacts**
	2022	**2023**	
Global Environment Facility (GEF) The GEF Monitoring Report 2022 The GEF Monitoring Report 2023	88.9	132.1	Financing from the Global Environment Facility (GEF) achieved the following impacts in fiscal year 2022 (the period from 1 July 2021 to 30 June 2022) and fiscal year 2023 (the period from 1 July 2022 to 30 June 2023) (the figures for 2023 are provided in parentheses): (a) 18.1 million (59.1 million) hectares of terrestrial protected areas and 30,000 (20.8 million) hectares of marine protected areas created and under improved management; (b) 5.9 million (19.6 million) hectares of landscape area and, in 2023, 1.1 million hectares of marine habitat under improved practices to benefit biodiversity; (c) 900,000 (5.6 million) people benefiting from the conservation, sustainable use or restoration of biodiversity; (d) 2 million (2.3 million) people benefiting from sustainable land management and restoration investments. In addition, GEF investments reduced greenhouse gas emissions by 147.3 million (742.6 million) tonnes, chemicals of global concern and their waste were reduced by 4,500 (11,600) tonnes, and persistent organic pollutants to air were reduced by 4 (106.3) grams of toxic equivalent.
Least Developed Countries Fund (LDCF) FY22 Annual Monitoring Review of the Least Developed Countries Fund and Special Climate Change Fund (GEF) FY23 Annual Monitoring Review of the Least Developed Countries Fund and the Special Climate Change Fund (GEF)	44.0	39.0	The Least Developed Countries Fund supports adaptation measures in particular. As of 30 June 2022, its active portfolio comprised 74 projects. As of 30 June 2023, its active portfolio comprised 70 projects. These projects had approximately 2.1 million direct beneficiaries in 2022 (2.5 million in 2023) and provided over 163,000 individuals with training in various aspects of climate change adaptation. An estimated 407,000 hectares of land had also been brought under more resilient management (317,540 hectares in 2023). In addition, over 320 (295 in 2023) strategies and plans (such as local planning and budgeting guides) had been developed or strengthened in order to better address climate change risks and adaptation.
Multilateral Fund for the Implementation of the Montreal Protocol to protect the ozone layer (MLF)	5.0	5.0	The Multilateral Fund for the Implementation of the Montreal Protocol covers additional costs that developing countries incur in their efforts to phase out ozone-depleting substances in compliance with the Protocol. Since its establishment in 1991, the fund has provided USD 4.07 billion in co-financing for a total of 9,658 projects (as of the end of 2023). 144 countries have received support. A total of 498,607 ODP tonnes of ozone-depleting substances (consumption and production) and 895.3 tonnes of HFCs were phased out (the equivalent of 1.93 billion tonnes of CO_2e) at a cost of USD 0.07 per tonne of CO_2. The reduced use of HFCs avoids the equivalent of roughly an additional 105 billion tonnes of CO_2 and will cut global warming by up to 0.5°C by 2100.

Project name (click on the project name to visit the website)	Eligible expenditures (in € million)		Qualitative description of impacts
	2022	2023	
Green Climate Fund (GCF)	320.0	307.2	In 2022, the Board of the Green Climate Fund (GCF) approved a total of 19 project applications that were granted GCF funding totalling USD 1.51 billion (or USD 4.8 billion when co-financing is included). In 2023, the GCF Board approved 34 projects (with USD 2.1 billion in GCF funding). As of the end of 2023, the GCF's project portfolio totalled USD 13.5 billion (USD 51.8 billion including co-financing), which meant that the GCF was able to leverage co-financing of USD 2.84 for each dollar of GCF funding. The GCF's project funding can be broken down according to the following priority regions: USD 3.6 billion for Small Island Developing States (SIDS), USD 6.5 billion for least developed countries (LDCs) and USD 6.7 billion for Africa. GCF funding disbursed for projects under implementation increased significantly in 2023, with USD 931 million disbursed to 110 projects on the ground. As of end 2023, cumulative GCF disbursements for its entire portfolio totalled just under USD 4 billion, with 84% of its overall portfolio under implementation. As of end 2023, the GCF has provided funding for 243 projects in 129 countries, with funding split evenly between mitigation and adaptation. Project funding is expected to lead to (a) CO_2 reductions totalling 2.9 billion tonnes and (b) 1.1 billion beneficiaries with increased resilience to the effects of climate change.
Contributions to climate risk insurance/the Global Shield	43.0	40.0	Launched at COP27 by the Vulnerable Twenty (V20) Group and the G7, the Global Shield against Climate Risks aims to provide particularly climate-vulnerable people and countries with systematic, coherent and sustained financial protection against the consequences of extreme weather events. The Global Shield's central priority is to provide quick support with forward-looking financing mechanisms. Comprehensive protection packages are prepared for partner countries in an inclusive process of analysis and consultation. The first countries/regions to receive protection packages in 2022 were Bangladesh, Costa Rica, Ghana, the Pacific Island countries, Pakistan, the Philippines and Senegal. Reports on specific impacts are not yet available.
City Climate Finance Gap Fund	6.0	5.0	Launched in September 2019, the Gap Fund helps cities in developing and emerging countries to plan and prepare climate-friendly and climate-resilient infrastructure projects. By the end of 2023, 201 cities in 58 countries had received support in preparing bankable projects designed to promote sustainable and climate-resilient urban development. The implementation of financing arrangements concluded between cities and international financial institutions generates potential for greenhouse gas emissions reductions.
Climate Support Facility (CSF)	37.5	30.0	The Climate Support Facility (CSF) is one of the World Bank's main "umbrella trust funds" in the climate sector. It supports the carbon-neutral and climate-resilient development of World Bank partner countries and facilitates the enhancement and implementation of nationally determined contributions (NDCs) and long-term strategies (LTSs). In 2022 and 2023, Germany supported the two CSF pillars targeting green recovery and NDC/LTS support and initiated a new "Whole-of-Economy Program" that promotes economy-wide reforms to accelerate green transformations.

Project name (click on the project name to visit the website)	Eligible expenditures (in € million)		Qualitative description of impacts
	2022	2023	
Central African Forest Initiative (CAFI)	73.55	27.15	The Central African Forest Initiative promotes sustainable forest management and agricultural practices, good governance and land use reform in six Central African countries. This support helps to protect the Central African forest, which absorbs 4% of the world's CO_2 emissions. By the end of 2022, the initiative had supported over 40 projects with 75 million tonnes of anticipated CO_2 emission reductions. The reductions vary according to the type of measure (e.g. forest conservation, agroforestry or natural regeneration) and range from 0.04 t CO_2 to 0.5 t CO_2 per USD.
PROGREEN	60.0	48.0	PROGREEN – a global partnership for sustainable and resilient landscapes – supports projects that promote the protection, sustainable use and restoration of terrestrial ecosystems, especially forests and productive landscapes. From 2021 to 2024, over 40,000 people benefited from partnership activities, over one million hectares of land were restored, and over 500,000 hectares of land were brought under sustainable forest management.
Forest Carbon Partnership Facility (FCPF) – EnABLE (Enhancing Access to Benefits while Lowering Emissions)	8.45	16.85	Launched in 2020, the objective of the EnABLE multi-donor trust fund is to strengthen the inclusion of indigenous peoples and local communities in the emissions reduction programme of the Forest Carbon Partnership Facility's (FCPF) Carbon Fund and, prospectively, in the World Bank's umbrella trust fund Scaling Climate Action by Lowering Emissions (SCALE). EnABLE works to ensure that, in the FCPF's 15 Carbon Fund countries, forest-dependent indigenous groups and civil society organisations receive a fair allotment of funds from benefit-sharing plans, thereby improving the inclusiveness of the countries' forest and land use programmes.
Sustainable Energy Fund for Africa (SEFA)	30.0	30.0	SEFA is a multi-donor trust fund that is managed by the African Development Bank. Its objective is to mobilise private investment in renewable energy and energy efficiency projects throughout Africa, and thereby to promote sustainable development and energy access in Africa while simultaneously contributing to economic growth and environmental protection. In 2022, seven projects were approved for a total funding amount of USD 39.5 million. The projects' expected impacts include mobilised investments totalling approximately USD 3.2 billion, 1,200 MW of new renewable energy capacity and about 668,000 new electrical connections. In 2023, five SEFA projects mobilised investments totalling USD 815 million, which were used to install 42 MW of renewable energy capacity, provide over 2.5 million new power connections, reduce annual greenhouse gas emissions by about 1.6 million tonnes, and create over 7,000 direct employment opportunities.

Project name (click on the project name to visit the website)	Eligible expenditures (in € million)		Qualitative description of impacts
	2022	2023	
CIF (Climate Investment Funds)	60.0	95.0	CIF (Climate Investment Funds) comprises two funds: the Clean Technology Fund (CTF) and the Strategic Climate Fund (SCF). CIF provides financing for transformative climate change mitigation and adaptation measures in developing and emerging countries. This financing aims to close funding gaps and promote innovative solutions. Funding is implemented exclusively by multilateral development banks. CIF's implementation is regarded as successful, and its funding has proven to have high leverage potential. Germany's contribution in 2022 went entirely to the CTF. In 2023, €75 million of Germany's contribution went to the CTF, and €20 million to the SCF.
PROBLUE	10.0	5.0	PROBLUE was launched in November 2018 as a World Bank multi-donor trust fund with a seven-year term. Its aim is to develop integrated, sustainable and healthy marine and coastal resources as a contribution to SDG 14 ("Conserve and sustainably use the oceans, seas and marine resources for sustainable development"). By the end of 2023, 52 projects in 80 countries had been successfully completed, and a further 129 projects are under implementation. These activities (a) promoted regional cooperation to strengthen blue economies in 44 countries and (b) advanced the blue economy knowledge base by producing 322 knowledge products and 85 tools and by conducting 427 workshops and consultations. In addition, these activities contributed to the development and design of 31 policy measures, strategies and regulatory schemes to improve policy frameworks for blue economies.
Special Climate Change Fund (SCCF) FY23 Annual Monitoring Review of the Least Developed Countries Fund and the Special Climate Change Fund – Global Environment Facility (GEF)	-	10.0	The SCCF is a special fund that supports adaptation and technology transfer measures. Germany's contribution in 2023 went to the funding window for Small Island Developing States (SIDS). As of 30 June 2023, the projects in the SCCF's active portfolio had reached over 831,000 direct beneficiaries and provided over 28,000 individuals with training in various aspects of climate change adaptation. In addition, over 426,000 hectares of land were brought under more resilient management. Furthermore, over 66 strategies and plans had been developed or strengthened in order to better address climate change risks.
AFR100	-	40.0	The objective of the African Forest Landscape Restoration Initiative (AFR100) is to restore 100 million hectares of forest and productive woodlands by the year 2030. Germany's support is targeted towards the establishment of a financing mechanism for AFR100. Direct financial and technical support is to be provided to local forest and farm producer organisations (FFPOs) and micro, small and medium-sized enterprises (MSME). This will facilitate the local implementation of restoration measures and improve income opportunities – especially for women and young people – through the valorisation of trees and related value chains.

Project name (click on the project name to visit the website)	Eligible expenditures (in € million)		Qualitative description of impacts
	2022	2023	
CLARIFI	-	5.0	The Community Land Rights and Conservation Finance Initiative (CLARIFI) is an international regranting mechanism that focuses on the mobilisation and strategic deployment of public and private funding. Priority areas include: (a) promoting formal recognition of the land rights of indigenous peoples and local communities (IPLC), (b) capacity-building for IPLC organisations and (c) supporting IPLC (nature) conservation plans. CLARIFI was initiated by the Rights and Resources Initiative (RRI).

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2.5. Specific funding

2.5.1. Entering markets abroad

	2022	2023
Budget chapter and item:	0904 687 05	
Eligible expenditures:	€16.8 million	€16.0 million
GHG emission reduction:	3,515 t CO_2e	199 t CO_2e
Funding share:	36.8%	85.2%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	b) c) d) e)

Assumptions and limitations: The GHG emission reductions in 2022 and 2023 were derived entirely from the German Energy Agency's Renewable Energy Solutions (RES) programme, with its four renewable energy reference installations that were built in various countries. The GHG reductions refer exclusively to reduction effects obtained during the project period (ex-post). They do not include projected savings generated by, for example, the ongoing use of renewable energy sources.

Investment by German companies in the construction of four reference installations under the RES programme amounted to €4.6 million in 2022 and €0.25 million in 2023.

The funding amount in eligible expenditures was €2.676 million in 2022 (with a federal funding share of 36.8%) and €1.444 million in 2023 (with a federal funding share of 85.2%).

Links:

https://www.german-energy-solutions.de/GES/Redaktion/DE/Standardartikel/Ihr-Export/dena-res-programm.html

https://www.gtai-exportguide.de/de/auslandsmaerkte/markterschliessungsprogramm/ueber

https://www.german-energy-solutions.de/

The "Entering markets abroad" budget item finances various funding programmes to support German companies in developing foreign markets. These include the Energy and Environmental Technologies Export Initiatives and the Market Development Programme covering the following sectors: renewable energy, energy efficiency, environmental technologies, infrastructure, rail technology, smart transport, smart cities, public transport, and sustainable mobility.

Data on GHG emissions reductions in 2022 and 2023 is available only for the Renewable Energy Solutions (RES) programme. A qualitative description of impacts is provided for selected projects below.

Project name	Qualitative description of impacts
SME business missions supported by the Energy and Environmental Technologies Export Initiatives and the Market Development Programme	Selected B2B meetings enable German SMEs to present their products and services to interested foreign entities and apply for local projects. The resulting business deals facilitate the transfer of environment- and climate-friendly technologies to the countries concerned. Just as importantly, participants make contact with potential business and cooperation partners while also obtaining qualitative information on competition, market potential, formal and/or cultural barriers, and the potential need to make product adjustments. 111 business missions took place in 2022. 100 business missions took place in 2023.
Linking market mechanisms and climate finance in Africa	The Energy Export Initiative's existing foreign trade promotion instruments are complemented by development cooperation measures under the Project Development Programme. Such measures include providing local industries with advice on economically viable energy measures that can help open up and grow markets in developing and emerging countries. The programme focuses on (a) the pre-development of investment projects (e.g., from the identification of potential projects to feasibility studies) in the areas of renewable energy, energy efficiency and process heat and (b) establishing contacts with companies participating in the export initiative.

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2.5.2. Export of green and sustainable (environmental) infrastructure

	2022	2023
Budget chapter and item:	1601 892 02	
Eligible expenditures:	€12.7 million	€11.0 million
GHG emission reduction:	Not available	Not available
Projects:	60 (including 13 newly approved projects)	60 (including 23 newly approved projects)
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) c) d) e) f)	

Assumptions and limitations: The term "projects" also includes GIZ implementation modules and activities commissioned by GIZ.
Funding shares cannot be calculated because the co-financing rate varies from project to project (up to 100% funding).

Links:

- https://www.exportinitiative-umweltschutz.de/exportinitiative/evaluation/
- https://www.exportinitiative-umweltschutz.de/fileadmin/Dateien/Exportinitiative/Evaluation/Ziellaender-EXI-2024_CPS_bf.pdf
- https://www.exportinitiative-umweltschutz.de/exportinitiative/ueber-die-exportinitiative/investive-komponente/
- Contributions of GIZ project modules to the Sustainable Development Goals: https://greentechknowledgehub.de/publications/contribution-sustainable-development-goals-sdgs
- Tree planting campaign: https://www.exportinitiative-umweltschutz.de/exportinitiative/baumpflanzaktion/

Since 2016, the Export Initiative for Environmental Protection (or EXI for short, formerly the Export Initiative for Green Technologies) has been helping German green tech companies (including SMEs) to internationalise their "green" innovations, products and services.

Run by the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV), EXI is thus a well-established, business-focused environmental programme that is highly sought after by companies. As of December 2024, it has provided funding for 191 projects in 98 countries.

EXI supports systemic and sustainable solutions by providing funding for efficient and eco-friendly technologies that not only drive growth and innovation but also serve to raise environmental standards, spread knowledge and thus sustainably protect resources and ecosystems and improve local living conditions. In addition to these environmental benefits, the programme contributes to greater prosperity (and SDGs) by promoting lifestyle changes and different consumption habits. Furthermore, by raising awareness of German environmental technologies and expertise, it enhances Germany's position as a leading development partner (trust-building).

Projects in 2022 and 2023 are divided into categories as follows:

	2022		2023	
Thematic area	Number of newly approved projects	Number of projects funded	Number of newly approved projects	Number of projects funded
Green hydrogen and fuel cell technology	1	6	5	9
Circular economy	3	22	6	19
Sustainable urban and regional development	-	-	-	-
Sustainable mobility	-	2	-	1
Cross-sectional technologies	2	7	5	8
Water/wastewater management	7	17	5	16
Contract award projects	-	6	2	7

Updated figures and regional breakdowns are available on the EXI website: https://www.exportinitiative-umweltschutz.de/en/export-initiative/regional-activities/. The website also provides project descriptions. Further information can be found in the 2021 Impact Report. The BMUV plans to conduct a second programme evaluation in 2026, which will cover the years from 2020 to 2024-25.

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2.5.3. International cooperation

	2022	2023
Budget chapter and item:	1604 532 05	
Eligible expenditures:	€8.0 million	€5.1 million
GHG emission reduction:	Pursues other objectives	Pursues other objectives
Projects:	18	30
Grants to joint initiatives:	8	16
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	 f)	
Assumptions and limitations: --		
Links: --		

Support is provided for international cooperation activities in general, and in particular for measures and projects that are specifically designed to combat the illegal trade in elephant and rhinoceros products in key source, transit and buying countries.

For many years now, Germany has been a leading advocate for international cooperation in the areas of nature conservation and biodiversity. This is widely recognised, and it means that Germany faces high expectations – and, at the same time, can exert influence – when it comes to making progress in global nature conservation. It also means that high demands continue to be placed on the budget item for international nature conservation. The following activities in particular were supported in 2022:

- Development of the post-2020 global biodiversity framework; follow-up work on Germany's priorities at the 14th Conference of Parties to the CBD (2018); preparations for the postponed 15th Conference of Parties to the CBD in 2021/2022
- Follow-up to the 18th Conference of the Parties to CITES (the Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora) in summer 2019, as well as further work to strengthen the Convention
- Follow-up to the 12th Conference of the Parties to the Bonn Convention on the Conservation of Migratory Species of Wild Animals; further development and implementation of regional agreements under the auspices of the Bonn Convention; preparing and holding the postponed 13th Conference of the Parties in 2021/2022
- Negotiation and subsequent implementation of a new implementing agreement to protect marine biological diversity
- German Presidency of the Trilateral Wadden Sea Cooperation with Denmark and the Netherlands; further Wadden Sea cooperation with Denmark and the Netherlands
- Anti-poaching measures and projects; measures and projects that are specifically designed to combat the illegal trade in elephant and rhinoceros products in key source, transit and buying countries
- Cooperation within the framework of UNESCO Natural World Heritage; cooperation with Slovakia and Ukraine

within the joint framework of World Heritage Beech Forests

- Support for activities along the European Green Belt
- Cooperation within UNESCO's "Man and the Biosphere" (MAB) programme; cooperation within UNESCO's World Network of Biosphere Reserves
- International workshops and conferences on forest restoration
- Cooperation to protect wetlands within the framework of the Ramsar Convention
- Support for ongoing international negotiation processes (especially UNFCCC and ICAO) and for activities pertaining to nature-based solutions for international climate change mitigation.

The following activities in particular were supported in 2023:

- Germany's G7 Presidency and international conferences related to the United Nations Framework Convention on Climate Change (UNFCCC), the UN Convention on Biological Diversity (CBD) and the UN Convention to Combat Desertification (UNCCD)
- UN Decade on Ecosystem Restoration, the 15th UN Biodiversity Conference (CBD COP 15), and the 10th plenary of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES 10)
- Support for a UN agreement establishing a marine protected area in the Weddell Sea and for a UN agreement to protect marine biological diversity
- Preparing, organising and holding various Conferences of the Parties to various conventions that Germany has joined, such as the Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Bonn Convention on the Conservation of Migratory Species of Wild Animals; further development of regional agreements under the auspices of the Bonn Convention
- Support for and cooperation within the frameworks of UNESCO World Heritage, the European Green Belt, UNESCO's Man and the Biosphere programme (World Network of Biosphere Reserves), joint Wadden Sea protection with Denmark and the Netherlands, international workshops and conferences on forest restoration, and the Ramsar Convention (wetland protection)

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2.5.4. Special initiative “One World – No Hunger” / “Transformation of Agricultural and Food Systems”

	2022	2023
Budget chapter and item:	2310 896 31	
Eligible expenditures:	€683.7 million	€324.0 million
GHG emission reduction:	Not available	Not available
Total number of projects:	64	65
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) e) f)	
Assumptions and limitations: --		
Links: --		

Under the name “One World – No Hunger”, the special initiative in 2022 financed projects that fight hunger and malnutrition and that support rural development as an important precondition for food security. Eligible expenditures include projects that promote the climate-friendly use of natural resources and land areas and that contribute to climate change adaptation.

In 2023, German development policy continued to support the fight against hunger and malnutrition under the special initiative, which had been renamed “Transformation of Agricultural and Food Systems”. The special initiative reinforces Germany’s development cooperation activities in three priority areas: food security, rural development and agriculture. Eligible expenditures include projects that promote the climate-friendly use of natural resources and land areas and that contribute to climate change adaptation.

Quantitative impact indicators are not available for all projects. For this reason, available data is reported only for selected projects that account for about 27.7% of eligible expenditures in 2022 and about 49.1% of eligible expenditures in 2023.

Project name	Eligible expenditures (in € million) 2022	2023	Impact indicators	Description
Global soil conservation and rehabilitation programme	27.7	28.0	In seven partner countries, soil conservation and rehabilitation was integrated into 53 national and local strategies and plans. In seven partner countries, 812,149 hectares of degraded land used by smallholder farmers were conserved or rehabilitated. 48% of the 608,415 participating smallholder farmers (including 104,197 women) used grant-aided packages of agroecological measures for purposes of climate change adaptation.	The project implements sustainable soil conservation and rehabilitation methods. Soil degradation reduces the amount of arable land available for cultivation and therefore has a direct impact on the food security of smallholder farmers in countries of the Global South. The project works in consultation with relevant ministries and promotes sustainable land use through agroecological practices and the involvement of smallholder farmers, researchers, businesspeople and civil society organisations.
Global programme for Green Innovation Centres in the agri-food sector	72.7	47.8	The productivity of 1.6 million smallholder farms that use the grant-aided innovations increased by an average year-on-year rate of 7%. 1,323,980 of the smallholder farms receiving funding used climate-smart innovations. 21,391 additional jobs were created. 14,636 (68%) of these jobs were for young people, and 8,980 (42%) were for women.	The project provides funding for advisory, training and educational measures at 16 Green Innovation Centres in 16 countries (14 countries in Africa plus India and Vietnam). The Green Innovation Centres provide support to smallholder farmers (particularly women and young people), with the aim of boosting their productivity, incomes and climate resilience. In addition, the centres work together with micro, small and medium-sized enterprises (MSMEs) that carry out upstream and downstream business activities in the funded value chains.
Global programme to promote agricultural finance for agri-based enterprises in rural areas	13.5	11.7	207,274 agricultural business owners and 9,411 agri-based business owners in rural areas made use of 288,413 customised or newly developed financial services offered by financial institutions that received programme funding. 41% of these business owners were women, and 32% were young people. 140 financial services (including 62 with integrated digital applications) were customised or newly developed in close cooperation with selected financial institutions. 132,133 persons from agricultural businesses and 5,097 persons from agri-based businesses in rural areas completed	The project improves agricultural and agri-based businesses' access to needs-based financial services in nine sub-Saharan African countries (Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Malawi, Mali, Nigeria, Togo and Zambia). It combines (a) a focus on improving the bankability of smallholders, agricultural organisations and agri-based businesses with (b) capacity-building in the financial sector, in order to develop and provide suitable financial services for agricultural business models. These financial products include context-specific, digital applications and risk-reducing (agricultural) insurance products. Moreover, they are targeted in particular

Project name	Eligible expenditures (in € million) 2022	2023	Impact indicators	Description
			skill-building activities to learn how to use financial services that were customised to fit their needs.	towards the needs of agricultural producers and younger business owners.
Global programme for sustainable fisheries and aquaculture	16.5	13.3	An additional 109,198,000 tonnes of fish from sustainable fisheries and aquaculture were made available to food-insecure people each year. 21,799 additional fishing boats were registered and licensed. Jobs in small-scale fishery and aquaculture value chains increased by 606%. 72% of the 28,762 participants in training programmes applied what they learned in the programmes.	The project supports small-scale fishing and aquaculture enterprises in Africa and Asia, with the aim of supplying more sustainably produced fish products to local markets and the food-insecure population. In this way, the project contributes to food security, increased productivity and higher incomes. It also creates additional jobs in rural areas and strengthens the role of women in processing and distribution.
Global programme for sustainability and value creation in agricultural supply chains	26.0	30.1	The area under cultivation with sustainably produced agricultural commodities was expanded by 589,999 hectares. 85 global companies implemented gender-sensitive sustainability policies. 416,138 people gained the necessary knowledge to produce sustainably. 22% of these individuals were women, and 27% were young adults.	Working in close cooperation with global companies, international organisations and civil society, the project enhances the sustainability of selected agricultural supply chains. Socio-ecological change along supply chains protects the environment and climate, boosts social justice and promotes corporate responsibility.
Fund for the Promotion of Innovation in Agriculture (i4AG)	32.9	28.1	38 innovation partnerships were agreed in writing. 40 innovations were advanced, tested and – if reasonable and feasible – scaled. 1,790,942 individuals and 1,124 organisations strengthened their resilience against the effects of acute global food system crises.	i4AG provides funding for the pilot testing and replication of gender-sensitive innovations to promote sustainable agri-food sectors. By helping to improve efficiency and productivity, the project aims to achieve broad-based impacts that enhance food security, to boost and safeguard jobs and income, and to contribute to climate resilience and the conservation of resources such as land, water and biodiversity.

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2.5.5. International cooperation on energy, raw materials and technology

	2022	2023
Budget chapter and item:		6092 687 02
Eligible expenditures:		€50.5 million
GHG emission reduction:		Not available
Projects:		14
Funding share:		Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: --

Links:
https://climateandenergypartnerships.org/fileadmin/global/Documents/CEPs_Annual_Report_2025.pdf

The international energy cooperation is supported with €50.5 million in funding. This includes measures to support and continue bilateral and multilateral cooperation – in particular, measures that pursue the objectives of promoting the German and international energy transition, identifying new partners, helping partner countries build secure and sustainable energy supplies. Examples of such cooperation include the work of secretariats in partner countries, training courses, studies and events with international participants. Given the nature of this cooperation (i.e. in energy partnerships, energy dialogues and multilateral forums), it is not possible to establish a direct causal link with quantifiable CO_2 savings. The reporting is provided in the understanding that the measures will contribute substantially to global climate change mitigation.

The GIZ project "Just Transition & Green Energy Sector Recovery Ukraine" (short title: "Just Transition Project") is being implemented within the framework of the German-Ukrainian Energy Partnership. In particular, the project provides guidance and support to facilitate socially equitable structural change in Ukraine's coal regions. On behalf of the Federal Ministry for Economic Affairs and Climate Action (BMWK), GIZ is working to help Ukraine phase out coal, achieve fair structural change and rebuild its energy sector in line with green principles.

In a project co-financed by the European Commission, the BMWK has been supporting the ramp-up of green hydrogen production in Chile since 2023. Due to its geographic characteristics, Chile is extremely well suited for the production of green hydrogen and its derivatives. The project is being implemented by GIZ on behalf of the BMWK.

Further information and project examples can be found in the 2024 annual report on Climate and Energy Partnerships.

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3. Research, innovation and awareness-raising

Social, ecological and economic challenges cannot be overcome without research and development. Germany has a highly effective academic and research system that has made a major contribution over many years to building resilience for the future, both nationally and internationally. These research activities identify long-term trends and risks and propose concrete solutions for social and political processes. With its innovative capacity, the German research landscape advances the development of new solutions and products for achieving the SDGs in Germany and around the world. Participative, interdisciplinary and transdisciplinary research approaches that foster exchange between academia, policymakers, civil society and business are a key factor driving this innovative capacity.

The eligible expenditures in the research, innovation and awareness-raising sector include projects to enable and support education and innovation on climate and environmental issues. In particular, the funds are used to develop solutions to combat climate change, conserve ecosystems and biodiversity, and protect resources. This includes projects to develop innovations for the sustainable transformation of energy systems and to promote sustainable mobility, sustainable urban and regional development, and a circular economy.

The sustainability effects of research and development projects are not directly quantifiable or scalable for the entire sector, notably because at the time of expenditure it is not yet clear how the research results will be utilised. Where possible, however, expected quantitative impacts are given, or at least the number of beneficiaries and/or the number of funded projects. In addition, objectives and impacts are described for project examples in the budget items in order to make transparent the sustainability of research expenditures in the precompetitive phase.

The sector's eligible expenditures in 2022 amounted to €1,534.0 million and were distributed across 23 budget items. The sector's eligible expenditures in 2023 amounted to €1,679.3 million and were likewise distributed across 23 budget items. For both years, the budget items can be assigned to the following subsectors:

	2022		2023	
Subsector	**Eligible expenditures (in € million)**	**Number of budget items**	**Eligible expenditures (in € million)**	**Number of budget items**
Research for sustainability	609.4	7	550.5	7
Environmental protection, nature conservation and climate change adaptation	128.3	5	136.5	5
Aerospace, energy, transport and digitalisation	734.0	7	902.4	8
Lightweight and other construction solutions	62.3	4	89.9	3

Note: In accordance with the Green Bond Framework, research programmes were also assigned to other sectors, especially if there is a strong connection to a specific sector.

3.1. Research for sustainability

3.1.1. DATI, advancing innovation promotion and cooperation[25]

	2022	2023
Budget chapter and item:	3004 683 10	
Eligible expenditures:	€3.0 million	€4.2 million
GHG emission reduction:	Not available	Not available
Projects:	21	22
Beneficiaries:	15	17
Funding share:	33%	33%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b)	e)

Assumptions and limitations: In general, project duration is three years. Therefore the funding share is stated as 33%. Third-party financing is not taken into account.

Links:
https://www.forschungscampus.bmbf.de/forschungscampi/flexible-elektrische-netze
https://www.forschungscampus.bmbf.de/forschungscampi/mobility2grid

The eligible expenditures of the budget item serve the two research campuses Flexible Electrical Networks (FEN) and Mobility2Grid.

	2022		2023	
Research campus	**Eligible expenditures (in € million)**	**Number of projects**	**Eligible expenditures (in € million)**	**Number of projects**
FEN	1.1	11	2.1	11
Mobility2Grid	1.9	10	2.1	11

FEN (2022: 11 projects, 2023: 11 projects)

The requirements for existing power grids are changing due to the growing share of electricity from renewable energy sources as countries shift to clean energy. Power grids therefore need to become more efficient, effective and flexible. For this reason, the research campus FEN is researching flexible and automated direct current grids (DC grids) for future energy supply. These grids are meant to supplement or replace conventional alternating current grids, in order to ensure safe, efficient and flexible supplies as sectors that have not been powered by electricity up until now become increasingly electrified (e.g. heat, mobility) and decentralised and renewable energy sources are incorporated.

The transdisciplinary research at FEN focuses on the technical aspects of the DC technology's development within the research

[25] DATI is an abbreviation for the German Agency for Transfer and Innovation (*Deutsche Agentur für Transfer und Innovation*).

areas of grids and systems, components, digitalisation and socioeconomics but also covers questions of social acceptance and digitalisation.

In 2022, processes were developed for the planning of low-voltage direct current grids and for automated grid control using power electronic equipment. The energy-optimised supply of neighbourhoods and non-residential buildings using DC technologies and sector coupling was also analysed.

In 2023, algorithms were developed for the simulation of complex sector-coupled energy networks, enabling the planning of efficient and viable energy distribution networks. In addition, controls and switches for protecting direct current grids in the event of a fault were developed.

Mobility2Grid (2022: 10 projects, 2023: 11 projects)

Implementation of the energy and transport transition is one of the biggest challenges of our times. The research partners in the Mobility2Grid research project at the EUREF campus in Berlin-Schöneberg are working together to develop new solutions for intelligently connected energy systems in urban areas, relating in particular to strategies and technologies for electrified mobility. Another area of research is the social and economic acceptance of technological solutions. Research is also being carried out into the currently lacking but necessary economic and legal framework for sector coupling. In total, more than 30 different institutions and companies are involved in the Mobility2Grid living lab on the EUREF site.

Mobility2Grid launched its second five-year main phase in 2022, focusing on the research areas “Grid integration”, “Automated charging and driving”, “Electrification of fleets and depots” and “Neomobility: climate-neutral, efficient, connected”. Another important new element of the research campus’s strategy includes extending the activities of the living lab beyond the EUREF site to other innovative sites in Berlin related to the energy and mobility transformation (“transfer areas”).

In 2023, Mobility2Grid was able to strengthen its local and international ties, for example with an innovation exchange on efficient applications for autonomous driving hosted at the transfer area ringberlin together with the Berlin Senate Department for Mobility, and with a scientific exchange programme with the Department of Urban Management at Kyoto University. Furthermore, research on the use of hydrogen technology for efficient energy systems was expanded by means of a new cooperation project focused on research relating to the integration of H_2 power plants into the energy and mobility systems of urban areas.

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3.1.2. Bioeconomy

	2022	2023
Budget chapter and item:	3004 683 40	
Eligible expenditures:	€103.9 million	€101.6 million
GHG emission reduction:	Not available	Not available
Projects:	1,171	1,154
Beneficiaries:	399	421
Funding share:	33%	33%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) c) d) e) f)	

Assumptions and limitations: In general, project duration is three years. Therefore the funding share is stated as 33%. Third-party financing is not taken into account.

Links:

Future Research and Innovation Strategy (summary):

https://www.aufstiegs-bafoeg.de/SharedDocs/Publikationen/de/bmbf/FS/747580_Zukunftsstrategie_Forschung_und_Innovation_en.pdf?__blob=publicationFile&v=2

Brochure “Werkzeuge der Bioökonomie” (“Tools of the Bioeconomy”):

https://www.bmbf.de/SharedDocs/Publikationen/de/bmbf/7/31659_Die_Werkzeuge_der_Biooekonomie.html

Brochure “Bioeconomy in Germany”:

https://www.bmftr.bund.de/SharedDocs/Publikationen/DE/FS/31106_Biooekonomie_in_Deutschland_en.pdf?__blob=publicationFile&v=5

National Bioeconomy Strategy (summary):

https://www.bmleh.de/SharedDocs/Downloads/EN/Publications/national-bioeconomy-strategy-summary.pdf?__blob=publicationFile&v=6

Project Management Jülich (PtJ) website: Bioeconomy

https://www.ptj.de/biooekonomie

Website of the 10th anniversary of the funding line “Bioeconomy international” (*Bioökonomie International*)

https://www.bmftr.bund.de/SharedDocs/Publikationen/DE/7/839824_Biooekonomie_International.pdf?__blob=publicationFile&v=6

Projects in the area of bioeconomic research are funded with the aim of providing sustainable solutions for a bio-based economy in all application areas and sectors of the economy. Areas with potential include:

- Replacement of fossil raw materials with renewable raw materials, co-products and waste products
- Cascading use of substances and materials
- Adaptation of crops to climate change
- Development of more sustainable biotechnological methods and processes

The above areas are illustrated below with project examples. A publicly accessible data explorer also makes it possible to research and analyse bioeconomy biomass flows and global footprints (e.g. land use and water consumption).

https://www.monitoring-biooekonomie.de/en/

The following examples of projects were funded in at least one of the two years (click on project name to visit website):

Cascading use of substances and materials

The project PiñaFibre utilises plant waste from pineapple production to create a sustainable resource for fibre production. This international cooperation project with partners from Thailand and Columbia aims to produce bio-based textiles, thereby creating additional added value and sustainable products. By involving local stakeholders, the project actively contributes to applying the results in practice.

Development of more sustainable biotechnological methods and processes

The project "BioKon – Biogenic CO_2 conversion: comprehensive optimisation of biological methanation in bubble column reactors" aims to optimise the process of biological methanation in bubble columns. This enables the development of a method for the conversion of carbon dioxide and hydrogen (from electrolysis) into methane by means of biological methanation in bubble columns, which is suitable for retrofitting at biogas plants. This technology can contribute to enabling the storage of energy from surplus electricity using methane.

Replacement of fossil raw materials with renewable raw materials, co-products and waste products

Nearly all chemicals that consumers use on a daily basis can be traced back to less than ten basic chemicals and almost all of these are derived from fossil resources, most notably crude oil. Researchers from the University of Bielefeld and Japan are working together as part of the cooperation programme "Bioeconomy International" (*Bioökonomie International*) to develop platform chemicals from natural waste streams. The aim is to make the production of these basic chemicals more sustainable and cost-effective.

Development of more sustainable biotechnological methods and processes

The cost-effective and efficient storage of sustainably produced electricity currently poses a challenge for the energy transition. As part of the project "PtG-MEC – Development of a high-density microbial power-to-gas electrolysis cell", researchers at Electrochaea GmbH are working on enabling the storage of surplus electricity from renewable energy sources by converting carbon dioxide into renewable methane. The aim is to achieve this by combining conventional electrolysis with modern biotechnological processes and by using special microorganisms.

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3.1.3. Climate research and Earth's natural habitats – R&D projects (from 2023 onwards: Global change and climate research)

	2022	2023
Budget chapter and item:	3004 685 40	
Eligible expenditures:	€84.2 million	€75.2 million
GHG emission reduction:	Not available	Not available
Projects:	772	891
Beneficiaries:	291	338
Funding share:	33%	33%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b)	

Assumptions and limitations: In general, project duration is three years. Therefore the funding share is stated as 33%. Third-party financing is not taken into account.

Links:
https://www.fona.de/en/topics/climate.php

The research funding programme addresses the key challenges of global change in the research areas "Climate change trends and impacts", "Enabling conditions for climate action", "GHG reduction", "CO_2 removal", "Climate change adaptation" and "International climate partnerships". The research and development projects create a knowledge base and develop and explore actionable options. The funding thus makes important contributions to the implementation of the "Research for Sustainability" (*Forschung für Nachhaltigkeit*, FONA) strategy of the Federal Ministry of Education and Research (BMBF).

Key research areas are presented below. Selected examples from the reporting years are then described.

	2022		2023	
Research area	**Eligible expenditures (in € million)**	**Number of projects**	**Eligible expenditures (in € million)**	**Number of projects**
Climate change trends and impacts	16.8	144	13.2	211
Enabling conditions for climate action	10.8	146	7.8	103
GHG reduction	4.7	88	7.3	129
CO_2 removal	3.8	43	6.6	46
Climate change adaptation	15.6	161	11.6	171
International climate partnerships	32.5	190	28.7	231

Amazon Tall Tower Observatory (ATTO)[26]

At 325 metres, the BMBF project ATTO (Amazon Tall Tower Observatory) is the highest atmospheric measuring tower in the Brazilian Amazon rainforest. The unique research infrastructure provides important insights into the interactions between the rainforest and the atmosphere. The research conducted at ATTO contributes to a better understanding of greenhouse gas sources and sinks. Having detailed knowledge of the exchange processes between the atmosphere and terrestrial ecosystems is essential for understanding the global carbon budget, in particular. The quantification of the exchange fluxes of CO_2 and other greenhouse gases between land surfaces and the atmosphere is crucial both for a better understanding of scientific processes and for emissions trading. The chemical and physical processes in the atmosphere of the Amazon region and their feedback mechanisms on the climate also provide important information on the chemistry and physics of the global atmosphere and – as a region with extreme energy irradiation – on global hydrometeorological cycles. The BMBF is providing funding for ATTOplus in another phase from 2021 to 2025 with the aim of establishing the project internationally as a unique research infrastructure in the Amazon region.

K4 – Carbon dioxide reduction in concrete production thanks to low-lime clinker and carbonation hardening[27]

The project K4 aims to directly avoid carbon emissions during clinker production and – at the same time – permanently capture carbon dioxide in concrete. The project focuses on the development of low-lime clinker from recycled cement stone, which has been used little to date. Compared with limestone, recycled cement stone reduces carbon emissions in the production of clinker by 530 kg CO_2 per tonne, making up 63% of the emissions. In addition, resource consumption is minimised because the low-lime clinker requires little calcium. The project is also developing a new hardening method that permanently traps carbon dioxide in concrete. The aim is to achieve an annual CO_2 reduction of approximately 1.7 million tonnes. This will allow the cement industry to remain competitive even in the face of stricter emission requirements, and will promote sustainable production that will strengthen Germany's international position.

RegIKlim – Regional information for climate action[28]

The funding measure RegIKlim aims to provide cities and communities in Germany with local climate information. The specific data allows politics, business and the public administration to respond to climate changes in a targeted way and to plan and implement climate adaptation measures that are tailored to their region. The BMBF provides funding for eight projects in six model regions across Germany — from the East Frisian coast to the Central German Uplands and the Bavarian Oberland.

MiGWa – Innovative technologies for CO_2 avoidance in glass production[29]

Glass has become an indispensable material in the modern world. It is used in a large number of areas, ranging from household appliances and components in optoelectronics to applications in pharmaceutics and medicine. Glass production currently relies on fossil fuels, especially for heating melting tanks and for forming processes, which leads to significant carbon emissions.

The project MiGWa (an acronym based on the German words for microwave, glass and hydrogen) aims to develop two innovative technologies that directly cut out most of the carbon emissions in glass production. As part of the three-year project, heating systems are being developed and tested in pilot plant trials.

[26] https://www.fona.de/en/measures/research-infrastructures/climate-observation.php
https://www.attoproject.org/

[27] https://www.fona.de/de/massnahmen/foerdermassnahmen/KlimPro/K4.php

[28] https://www.fona.de/de/massnahmen/foerdermassnahmen/regionale-informationen-zum-klimahandeln.php

[29] https://www.fona.de/de/massnahmen/foerdermassnahmen/KlimPro/migwa.php

First, the project is researching how the energy required to melt glass raw materials can be integrated into the glass melting process in the most climate-neutral and efficient way possible using microwaves. Second, hydrogen burners are being tested for heating melting tanks and for hot post-processing. The focus is on how these new methods affect melting and forming processes, emissions and product features. The goal is to minimise the use of fossil fuels in the production of glass without affecting the required glass quality. The replacement of natural gas with climate-neutral hydrogen or regeneratively produced electrical energy can thus make a direct and effective contribution to the reduction of greenhouse gases.

Junior Research Groups Global Change: Climate, Environment and Health[30]

The BMBF's funding initiative "Junior Research Groups Global Change: Climate, Environment and Health" links research on climate change and the environment with health sciences, in order to achieve a better understanding of how climate change affects human health. The aim is to have young scientists contribute to the development of effective precautionary measures with innovative ideas. The initiative also promotes cooperation with the least developed countries (LDCs) that are particularly vulnerable to the health effects of climate change. The BMBF provides funding for 12 junior research groups for a period of five years.

Urban climate in transition[31]

From 2015 to 2023, scientists involved in the project "Urban Climate in Transition" (*Stadtklima im Wandel*) addressed in detail the challenges that cities in Germany face due to high temperatures, storms and air pollution. The main aim was to provide cities with a reliable and practical tool for measuring pollution caused by the urban climate. Precise and solid data is required for the development of effective measures to improve the urban climate and air quality. To this end, a new computer model for urban climate modelling was developed together with future users, such as local authorities, that makes it possible to calculate pollution down to the level of individual buildings.

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[30] https://www.fona.de/en/measures/funding-measures/junior-research-groups-climate-environment-and-health.php

[31] https://www.fona.de/en/measures/archive/urban-climate-under-change.php

3.1.4. Energy technologies, efficient energy usage, green hydrogen – R&D projects

	2022	2023
Budget chapter and item:	3004 685 41	
Eligible expenditures:	€194.4 million	€171.0 million
GHG emission reduction:	Not available	Not available
Projects:	573	638
Beneficiaries:	311	326
Funding share:	33%	33%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b)	e)

Assumptions and limitations: In general, project duration is three years. Therefore the funding share is stated as 33%. Third-party financing is not taken into account.

Links: All projects can be found at https://www.fona.de/en/

The federal government's energy research makes a decisive contribution towards building a sustainable energy system in Germany. Key areas of focus here are energy technologies, efficient energy use, green hydrogen, electricity grids and storage systems, industrial processes and sector coupling. The following projects supported these research areas in 2022 and/or 2023 and delivered important results.

OdH@Jülich

The exchange of energy between sectors, such as the electricity and heating sector, offers many opportunities for a sustainable transformation of the energy system. This creates a complex system with strong interactions and feedback. Coordinated by the Fraunhofer Research Institution for Energy Infrastructures and Geothermal Systems (IEG), the research project ODH@Jülich is developing an open and integral planning and simulation tool. It thus lays the foundation for a comprehensive, cross-sector energy supply in urban districts and a (partially) automated planning and operation management process, thereby facilitating investment decisions for supply systems that are meant to last for decades.

Saerbeck-PLUS

The energy transition is a challenge for society as a whole. In order for it to succeed, citizens as well as companies and local authorities need to be involved. This allows issues relating to the system integration of renewable energies and cross-system issues such as social aspects of the energy transition to be addressed under real conditions.

The joint project Saerbeck-PLUS examines questions relating to the type of knowledge and competence that is necessary for successfully engaging citizens in the energy transition. The project partners – Förderverein Klimakommune Saerbeck e.V. (Friends of the Saerbeck Climate Community), located in the town of Saerbeck, and the Leibniz Institute for Science and Mathematics Education (IPN) at Kiel University – aim to make the knowledge that has been acquired on the implementation of the energy transition at the local level available to other local authorities nationally and internationally.

CarbonCycleMeOH

Even comprehensive investments in climate action will not make it possible to prevent all industrial carbon emissions in the long term. However, to stop carbon dioxide from

entering the atmosphere, it can be captured and used as a raw material. The CarbonCycleMeOH feasibility study now also focuses on the chemicals sector. At the Bitterfeld-Wolfen Chemical Park, partners from science and business want to find out how the plant's exhaust fumes and green hydrogen can be used to make methanol and methanol derivatives. The study examines the technical feasibility as well as possible production capacities and economic consequences.

FemtoPEM

Proton exchange membrane water electrolysis (PEM electrolysis) is considered one of the most efficient and flexible technologies for hydrogen production. The project FemtoPEM aims to enhance the transport layers of PEM electrolysers. The transport layers are necessary for transporting the water to be split during electrolysis to the catalyst layer where water splitting occurs. The porous transport layers must ensure the transport of the water, the removal of the generated gas and the electrical contact of the electrolysers. They therefore have a decisive impact on the efficiency of electrolysers. FemtoPEM aims to optimise the transport layers by testing new material processing technologies on the one hand and new material coatings on the other.

HYPAT

Germany will continue to rely on energy imports in the long term, too. It will therefore have to purchase a large share of green hydrogen from regions in the world that are rich in wind and solar power. The question that arises, however, is from where. To answer this question, the project HYPAT is developing a global hydrogen atlas with the aim of identifying and analysing, for the first time, all of Germany's possible partner countries for a future hydrogen economy. In addition to identifying in detail the global techno-economic potential and analysing hydrogen transport chains and the potential development of hydrogen prices in the international market, the analysis also takes into account the partner countries' needs. These needs include meeting their domestic energy demand in a sustainable manner, achieving their own climate goals by making use of the economic development potential of a hydrogen economy and complying with specific sustainability criteria for the hydrogen economy in the partner countries.

EPRoC

The German government's 7th Energy Research Programme (*7. Energieforschungsprogramm*) is focused on research and development in the field of innovative energy technologies. The joint project EPRoC contributes to gathering analytics for energy research. The project aims to research and develop a prototype of a chip-based electron paramagnetic resonance spectroscopy (EPRoC). The goal is to explore the exceptional opportunities of the novel EPRoC technology in different areas, develop its scientific basis, overcome potential weaknesses, such as a lack of measurement sensitivity, and identify new areas of application, especially in energy research. Another goal of the project is to unlock the potential of the technology and integrate the methodology into basic research within the next three years. A successful development of this revolutionary spin sensor technology could spearhead a new high technology in Germany. Based on the project's findings, the aim is to ensure that the EPRoC technology can be developed to market maturity within the next ten years. The necessary scientific conditions are being developed jointly. The miniaturisation of EPR will open up new areas of application and can lead to a revolution in energy materials research, sensor technology, medicine, environmental technology and food and analytical chemistry.

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3.1.5. Environmental technologies, resources and geological research

	2022	2023
Budget chapter and item:	3004 685 42	
Eligible expenditures:	€117.3 million	€99.9 million
GHG emission reduction:	Not available	Not available
Beneficiaries:	1,640	1,456
Expert panels, professional conferences and status seminars:	34	38
Funding share:	33%	33%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) c) d) e) f)	

Assumptions and limitations: In general, project duration is three years. Therefore the funding share is stated as 33%. Third-party financing is not taken into account.

Links:
* https://www.fona.de/en/topics/research-for-more-efficiency.php
* https://www.remin-kreislaufwirtschaft.de/en/
* https://bmftr-kurt.de/kurt/en/
* https://www.era-min.eu/joint-call/era-min-joint-call-2023
* https://www.bmbf-wax.de/en/
* https://digitalgreentech.de/
* https://ressourceneffiziente-stadtquartiere.de/?lang=en
* https://zukunftsstadt-stadtlandplus.de/at-a-glance-in-english
* https://kommunen-innovativ.de/
* https://regulus-waldholz.de/en/
* https://www.projektfoerderung-geo-meeresforschung.de/geowissenschaften

The eligible expenditures of the budget item are distributed among the programme areas as follows. Examples are described below.

	2022		2023	
Funding area	**Eligible expenditures (in € million)**	**Number of beneficiaries**	**Eligible expenditures (in € million)**	**Number of beneficiaries**
Environmental technologies and raw material efficiency	35.9	510	23.0	413
Sustainable water management	42.0	581	38.0	522
Sustainable land management	17.0	304	17.4	251
Geosciences	15.0	123	8.5	104
Digital Green Tech	7.4	122	13.0	166

Resource-efficient circular economy – construction and mineral material cycles (ReMin)

The transition from a linear to a circular economy is an enormous challenge for the construction industry with its high demand for resources, considerable carbon emissions – especially in cement production – and large quantities of mineral demolition waste. Cement production, for example, accounts for around 8% of global greenhouse gas emissions.

Making the construction industry more environmentally and climate-friendly calls for new approaches throughout the value cycle. One focus is on greater use of high-quality secondary raw materials from demolition waste. But to realise the full potential of the circular economy, it is necessary to go further, for example by using components that can be easily dismantled or by avoiding building materials that are hard to recycle. To this end, the Federal Ministry of Education and Research (BMBF) funds innovative approaches promoting circularity in construction under the funding measure "Resource-efficient circular economy – construction and mineral material cycles (ReMin)". Between 2021 and 2024, 17 joint projects have been funded for a total of €22 million.

Approaches already exist for closing the loop at the level of individual materials and can be trialled at scale with industrial partners. The EMSARZEM project coordinated by GKS-Gemeinschaftskraftwerk Schweinfurt GmbH, for example, investigated the use of waste incineration slag for cement production. There is also huge potential for innovation in the reuse of building components. With this in mind, the "Fertigteil 2.0" (Precast 2.0) project looked at the controlled dismantling of existing buildings and the manufacture of new, reprocessed precast concrete units with the aid of digitalisation and robotics.

Resource-efficient Circular Economy – Plastic Recycling Technologies (KuRT)

Plastics permeate our modern lives more than almost any other material. Flexible, light and versatile, they are used for countless purposes in all areas of life. In many application areas, they are key to improving energy and resource efficiency. Nevertheless, they also pose one of the biggest environmental challenges of our times. Macro and microplastics enter the environment and cause serious environmental problems in Germany and around the world. Compared to other materials, recycling plastics is particularly challenging and, because of this, only a small proportion of the material in existence is actually reprocessed into new, high-quality products.

"Resource-efficient Circular Economy – Plastic Recycling Technologies" (*Ressourceneffiziente Kreislaufwirtschaft – Kunststoffrecyclingtechnologien*, KuRT) is a funding measure directed at promoting plastic recycling by means of smart uses, improved logistics and collection, and innovative reprocessing methods for the high-quality use of recyclates. General objectives include improving the economic viability and quality of plastic recycling. Based on the conceptual phases funded from 2021, six joint projects were selected for the implementation phase from 2023 (total funding volume approximately €19 million over the full duration). These focus on, among other things, mechanical and chemical recycling processes.

WaX – Hydrological extreme events

Due to climate change, it is likely that Germany will also increasingly experience extreme events such as heavy rainfall, floods and periods of drought in the future. In the recent past, extreme precipitation events and large-scale floods have increasingly caused severe damage. The frequent heat waves and extremely dry summers in recent decades have also had serious effects on the economy, water supply and the ecological functioning and resilience of many surface waters. Against this background, the BMBF has launched the funding measure WaX. The aim of this measure is to contribute to the development and implementation of new interdisciplinary and cross-sectoral approaches to managing opposing hydrological extremes in order to reduce their effects on the aquatic environment and humans. Another goal is to develop innovative monitoring, forecasting and communication approaches, adapted

water infrastructures and operational and risk management strategies for dealing with opposing hydrological extremes.

Kommunen Innovativ (Innovative local authorities) – Supporting local authorities in the sustainable provision of services of general interest

The "Kommunen Innovativ" funding measure aims to strengthen the role of local authorities as initiators, partners and addressees of research, development and innovation. In the third phase (2021-2024), funding focuses on new approaches to services of general interest in the context of a sustainable development of local authorities. The funding measure contributes to the achievement of equivalent living conditions and is part of the overall German funding system for structurally weak regions.[32]

RES:Z – Resource-efficient urban districts for the future

"Resource-efficient urban districts for the future (RES:Z)" is a funding measure with the aim of improving resource efficiency in urban districts and supporting long-term transformation management. The research projects develop approaches for the efficient use of water, space, material streams, energy and green spaces in urban areas. One important objective of the funding is to develop new approaches to integrated planning and sustainable management of urban districts, involving all relevant stakeholders. Foundations were developed across all projects for indicators of sustainable district development and for DIN SPEC 91468, "Guidelines for resource-efficient urban districts" published in 2022.[33]

Geosciences – Aquifer Thermal Energy Storage

The BMBF's thematic focus on aquifer thermal energy storage (ATES) aims to research and advance ATES systems in order to create the basis for their integration into the energy infrastructure. The funded research and development projects focus on planning tools for mine thermal energy storage and condition monitoring, the analysis of hydrochemical interactions, the combination of ATES with groundwater remediation, the implementation of a low-temperature demonstration project, the assessment of regional ATES potential and the system integration of ATES into the energy network.

Digital GreenTech – Environmental Technology Meets Digitalisation

In order to promote the development of technologies that help to conserve natural resources and reduce environmental pollution, the BMBF has been funding smart, resource-conserving environmental technologies since 2020. From digital twins for refrigerators and AI-based sewer maintenance management to digital information management along the chain of stakeholders in the circular economy, the projects cover a wide range of innovative digital solutions in the fields of water management, resource efficiency and circular economy as well as geotechnology and sustainable land management.

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[32] https://kommunen-innovativ.de/

[33] https://ressourceneffiziente-stadtquartiere.de/?lang=en

3.1.6. Social sciences for sustainability

	2022	2023
Budget chapter and item:	3004 685 43	
Eligible expenditures:	€42.5 million	€36.6 million
GHG emission reduction:	Not available	Not available
Projects:	458	321
Beneficiaries:	315	243
Funding share:	33%	33%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) c) d) e) f)	

Assumptions and limitations: In general, project duration is three years. Therefore the funding share is stated as 33%. Third-party financing is not taken into account.

Links:
https://www.fona.de/de/en/topics/society-social-oecological-research.php

The eligible expenditures of the budget item are distributed among the programme areas as follows:

	2022			2023		
Programme name	**Eligible expenditures (in € million)**	**Number of projects**	**Number of beneficiaries**	**Eligible expenditures (in € million)**	**Number of projects**	**Number of beneficiaries**
Systemic approaches for sustainable urban mobility	10.3	103	75	11.2	107	79
Social-ecological junior research groups	7.9	53	38	8.3	40	32
Social-ecological research and economics	24.3	302	202	17.1	174	132

Mobility

MobilBericht II (Mobility Report II) – A tool for shaping sustainable urban mobility

The project Mobility Report II examines the existing transport situation, mobility needs and patterns of inequality in the district of Berlin-Pankow with the aim of setting up and establishing mobility reporting. The objective of this new transport planning tool is to strategically reshape just and climate-friendly mobility at the district level. The project outlines the current situation and presents specific measures that take the population's needs and the negative effects of transport into account. The project's target group includes city residents, the local administration and the scientific community. As part of the previous project MobilBericht I (Mobility Report I), the tool was applied in the district of Berlin-Pankow for the first time. As

a result, the first mobility report of this kind was published in Germany in 2021.

Between 2021 and 2023, the project Mobility Report II evaluated the processes related to the mobility report and identified problem areas relevant to sustainable transport development in Pankow. In addition, multiple transport surveys and formats for participation were implemented, serving as a basis for positive sustainability effects.

Between 2021 and 2023, the first measures to implement the mobility report were piloted in the "Kiezblock Komponistenviertel", a traffic-calmed neighbourhood block in the district of Berlin-Pankow, while also documenting the sustainable effects and acceptance of the measures. The focus was both on implementing the winning projects of the ideas contest for the design of public spaces and on conducting programmes for further training to promote the tool at the supraregional level.

Social-ecological research and economics

Biodiversity Valuing & Valuation (BioVal)

The project BioVal focuses on the overarching research question of how to increase biodiversity along the food value chain. The project cooperates with companies to explore how these can contribute to the promotion of biodiversity along product life cycles and how this can be established and communicated at management level. For this purpose, management and communication measures are developed and tested in livings labs together with three food companies.

An extensive consumer survey was conducted in 2022 in order to also take into account the societal perspective on values relating to biodiversity. This survey was discussed with stakeholders in the following year and recommendations were given to the three partner food companies on this basis.

The method for assessing the impacts of food production on biodiversity that was developed by the project team in 2022 was discussed with the partner companies and their suppliers and tested on individual products in 2023. A dashboard for quantifying the impact of land-use processes on terrestrial biodiversity was developed and tested.

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3.1.7. Marine, coastal and polar research

	2022	2023
Budget chapter and item:	3004 685 44	
Eligible expenditures:	€64.1 million	€62.0 million
GHG emission reduction:	Not available	Not available
Projects:	335	323
Beneficiaries:	85	83
Funding share:	33%	33%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) c) d) e) f)	

Assumptions and limitations: In general, project duration is three years. Therefore the funding share is stated as 33%. Third-party financing is not taken into account.

Links:
https://www.fona.de/en/topics/maren-coastal-marine-and-polar-research-for-ustainability.php

Federal government research programme: MARE:N – Coastal, Marine and Polar Research for Sustainability

The MARE:N federal government research programme provides the framework for coastal, marine and polar research. Activities funded under MARE:N aim to develop specific recommendations for decision makers to promote the sustainable use of coasts, seas and polar regions.

The MARE:N programme carries out comprehensive research in the area of climate preparedness, provides expertise in the areas of decision-making and taking action, and contributes to the development of forward-looking and innovative technologies. The scientific programme consists of six major interdisciplinary, interministerial and socially relevant focus points. These are: Global Change and Climate Events, Ecosystem Function and Biodiversity, Global Biogeochemical Cycles and Energy Fluxes, Management of Natural Hazards, Sustainable Use of Resources, and Governance and Participation. They are supplemented by three cross-cutting activity areas: Research Infrastructures, Measurement and Observation Technology, and Data and Information Infrastructure.

The research activities that form part of MARE:N address these focal points in the three areas of coastal, marine and polar research:

Coastal research:

German Marine Research Alliance (DAM) – Research mission "Protection and Sustainable Use of Marine Areas": Science-based and socially informed courses of action for developing strategies for the use and protection of marine areas.[34]

German Marine Research Alliance (DAM) Pilot Missions – North Sea and Baltic Sea Protected Areas: Exclusion of mobile bottom-contact fisheries (MBF) in marine protected areas – studies on the impacts of MBF exclusion on the status of waters in accordance with the EU Marine Strategy Framework Directive (MSFD).[35]

Coastal Research in the North Sea and Baltic Sea (KüNo) – Coasts in Transition: Investigation of the multi-factor impacts of climate change and land-use change on the integrity of coastal ecosystems, the future use

[34] https://www.ptj.de/projektfoerderung/mare-n/dam-schutz-und-nutzen

[35] https://www.ptj.de/projektfoerderung/mare-n/dam-schutz-und-nutzen

of coastal areas and the protection of the natural and human environment.[36]

German Coastal Engineering Research Council (KFKI): Applied research in coastal and flood protection and in the maintenance and construction of waterways and ports.[37]

Marine research:

German Marine Research Alliance (DAM) – Research mission: "Marine Carbon Sinks in Decarbonization Pathways" (CDRMare): Methods of marine carbon dioxide removal and storage are studied in terms of their potential, risks and possible side effects and impacts on the marine environment, the Earth system and society and integrated into a transdisciplinary assessment framework.[38]

Oceans under Stress (*Ozeane unter Stress*) – Analysis of direct anthropogenic influencing factors on ocean CO_2 absorption capacity: Analysis of direct anthropogenic influencing factors on ocean CO_2 absorption capacity and development of recommendations for the sustainable use of the oceans.[39]

Polar research:

Funding of bilateral joint projects with the United Kingdom as part of scientific and technical cooperation in marine and polar research: Investigation of the impacts of future change on biological and biogeochemical processes, productivity, species distributions, food chains and ecosystems in the North Atlantic.

Polar regions in transition (*Polarregionen im Wandel)* – Influence of global and regional stressors: Information about the influence of multiple anthropogenic stressors on the structure and functioning of polar regions to serve as a basis for a transformation process in politics and society.

Funding of grants for scientific data analysis of the MOSAiC Arctic expedition: The one-year observation and measurement programme "Multidisciplinary drifting Observatory for the Study of Arctic Climate" (MOSAiC) with the POLARSTERN research icebreaker collected data on processes coupling the atmosphere, sea ice and the oceans. The data is used in climate model calculations. The prerequisites for a web-based online platform are being created in order to visualise the MOSAiC data and make it available on an open-access basis. This will allow easy and interdisciplinary analysis of complex, heterogeneous and very large data sets to answer questions about the causes and consequences of the changing and shrinking Arctic sea ice cover.

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[36] https://deutsche-kuestenforschung.de/home.html
[37] https://www.kfki.de/en
[38] https://www.ptj.de/projektfoerderung/mare-n/dam-dekarbonisierung
[39] https://www.ptj.de/meeresforschung

3.2. Environmental protection, nature conservation and climate change adaptation

3.2.1. Research, studies, etc. [in the area of environmental protection]

	2022	2023
Budget chapter and item:	1601 544 01	
Eligible expenditures:	€42.2 million	€42.8 million
GHG emission reduction:	Not available	Not available
Projects:	132	121
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) c) d) e) f)	

Assumptions and limitations: --

Links:
https://www.bmuv.de/fileadmin/Daten_BMU/Download_PDF/Forschung/ressortforschungsplan_gesamt_2022_bf.pdf
https://www.bmuv.de/fileadmin/Daten_BMU/Download_PDF/Forschung/ressortforschungsplan_gesamt_2023_bf.pdf

Environmental policy action, the development of strategies and concepts, the assessment of environmental impacts and substance risks, and the observation of social, economic and technological trends all require a solid science-based decision-making foundation. Environmental rules and regulations have to be reviewed and revised, and ongoing environmental programmes and approaches must be accompanied by research. By bridging the gap between science and policymaking, the research conducted and commissioned by the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) made a significant contribution in this respect in 2022 and 2023. This research is generally geared towards helping the ministry and its higher federal authorities perform their tasks.

The ministerial research included in Green German Federal securities is divided into the areas of **environmental protection and climate action** (1601 544 01) and **nature conservation** (1604 544 01).

The eligible expenditures of the budget item "Research, studies, etc. in the area of environmental protection and climate action" (1601 544 01) are spread across the following research areas. Key research areas are described below the table. Further descriptions of the research areas can be found in the linked BMUV Environmental Research Plans for 2022 and 2023.

Programme name	Number of newly approved projects:
2022	
Climate action	11
Climate change adaptation	8
International environmental protection – in particular further development of the climate regime	10
Resource efficiency/circular economy	14
Environment and the economy, sustainable product and consumer policy, environment and social affairs	10
Groundwater, water, soil and marine conservation	12
Clean air/climate-friendly technologies/noise control/environmental requirements for the mobility transition	20
Environment and health	5
Substance risks	11
Urban environmental protection – sustainable land management	8
Environmental aspects of the energy transition	7
Cooperation with social groups/cooperation partners and cross-cutting environmental policy issues	16
2023	
Cross-cutting issues of environmental policy and environmental law/societal dialogue/international environmental protection (including participation)	17
Climate change adaptation/environmental aspects of climate action, energy	11
Resource efficiency/circular economy	11
Environment and the economy, environment and social affairs	6
Sustainable product policy	6
Groundwater, water, soil and marine conservation	10
Environmental requirements for the mobility transition/noise control/clean air/climate-friendly technologies	16
Environment and health and substance risks	19
Urban environmental protection – sustainable land management	5
Strategic core topics	20

Brief descriptions of key research areas:

Climate action

One area of research relating to climate action targets the development of innovative climate finance instruments. Research is also being conducted into the implementation of measures in the energy sector and various policy areas (such as structural policy and agricultural policy) from a climate action perspective. Conceptual and technical issues are also important, as are institutional aspects of carbon market development.

Climate change adaptation

Research in the field of climate change adaptation aims to help increase the climate resilience of our society. Specifically, this involves investigating management tools for mitigating climate risks in government and business and developing appropriate adaptation measures. This work relates in particular to areas such as soil biology, soil unsealing, flood control, heavy rain preparedness and low water risk management. Research is also carried out into the impacts of climate change on water availability and groundwater replenishment.

Resource efficiency/circular economy

The BMUV's research in the field of resource efficiency contributes to the transition to a circular economy. This research includes the development of tools to boost the recycling of construction products, etc. and the use of recycled materials, the development of strategies for the recycling of fibrous plastics, the development of approaches for waste prevention and for the management of individual waste streams, technology transfer and the digital transformation.

Environment and the economy, sustainable product and consumer policy, environment and social affairs

Environmental protection and climate action policy instruments also have an impact on the economy and consumers. For this reason, the BMUV investigates measures for making the social market economy more environmentally sustainable. This includes, in particular, identifying and evaluating environmentally harmful subsidies and developing environmental policy control instruments as economic incentives to promote environmental innovations. The research also contributes to knowledge transfer, for example by developing practical tools for the implementation of the European Eco-Management and Audit Scheme (EMAS), corporate social responsibility (CSR) and environmental and sustainability reporting in companies, local authorities and other organisations.

Groundwater, water, soil and marine conservation

Water bodies are complex and fragile ecosystems. It is therefore essential to understand the pathways by which chemicals and undesirable microorganisms are introduced, as well as detection methods and emission requirements. Measures for sustainable use of water bodies can only be established on the basis of sound knowledge. Soils are the foundation and a central component of terrestrial ecosystems and their biodiversity. They are a vital, non-renewable natural resource providing numerous services. Key challenges include protecting soil functions and remediating contaminated sites. Research needs to be carried out in this context into the effects of climate change and globalisation and also into legal developments.

The final reports of all ministerial research projects are available at: https://www.bundesumweltministerium.de/ministerium/forschung/forschungs-und-entwicklungsberichte

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3.2.2. Funding of climate change adaptation measures

	2022	2023
Budget chapter and item:	1601 685 01	
Eligible expenditures:	€41.4 million	€44.1 million
GHG emission reduction:	Pursues other objectives	Pursues other objectives
Projects:	368	358
Approved projects:	142	44
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	b)	
Assumptions and limitations: --		
Links: https://www.z-u-g.org/das/info/ https://www.z-u-g.org/anpaso/info/		

In the expenditure years 2022 and 2023, the budget item is used again to finance, among other things, two funding guidelines that each target different stakeholders.

"Measures for adaptation to climate change impacts" (*Maßnahmen zur Anpassung an die Folgen des Klimawandels* – DAS) funding guidelines

The "Measures for adaptation to climate change impacts" funding guidelines serve to implement the German Strategy for Adaptation to Climate Change (DAS). Funding is primarily provided for local and local-authority players, and additionally for associations, medium-sized companies and educational institutions in the following funding priorities:

A. Initiating local-authority adaptation management

A.1 Development of a sustainable adaptation strategy by climate adaptation managers

A.2 Implementation of the sustainable adaptation strategy

A.3 Selected climate change adaptation measure

B. Innovative model projects for climate change adaptation

B.1 Strategy development

B.2 Strategy implementation

The funding guidelines address urgent action areas by funding local-authority adaptation management and innovative model projects for climate adaptation. Grants of up to €275,000 are available in each case for the first area and of up to €500,000 for the second. In the case of innovative model projects (funding priority B), the funding guidelines prioritise outcomes that are readily transferable to similarly affected regions and actors.

The "Climate adaptation in social institutions" (*Klimaanpassung in sozialen Einrichtungen* – AnpaSo) funding guidelines

The "Climate adaptation in social institutions" funding guidelines are intended to make it possible to address and implement necessary climate adaptation processes in the health, nursing care and social sectors. The aim is to stimulate transformation in the sector by funding model projects that inspire others. Projects are intended to have an impact primarily in regions that are or will be

particularly affected by the climate crisis (so-called climate hotspots).

Funding is provided as follows:

- Funding priority 1: Development of sustainable climate change adaptation strategies
- Funding priority 2: Implementation of model climate change adaptation projects based on climate change adaptation strategies
- Funding priority 3: Intersectional support provided by social sector climate change adaptation officers (staff funding)

The overall focus is on nature-based solutions. This is intended to generate synergies and positive side-effects in relation to the objectives of the German Sustainable Development Strategy resulting in improvements in environmental sustainability and quality of life. In addition, the social institutions granted funding are intended to disseminate the model projects beyond the region as best practice examples and encourage their replication elsewhere.

Project example: **Climate-adapted landscaping of the Villa Samariter's open spaces:** Installation of a rainwater cistern, a water feature and a gazebo providing protection against the sun (duration: 1 June 2021 to 30 April 2022, funding volume: €109,932.20)

The increasing heat stress during hot summer days is hard on many elderly people and those in need of care and can even lead to health risks. The new landscaping of the Villa Samariter's outdoor areas aims to minimise the risks of heat stress. First, a large gazebo installed in front of the building provides an additional shady spot. Second, the air temperature in the immediate vicinity is reduced thanks to the installation of a water feature. A rainwater storage tank connected to the water well provides water. This enables ecological irrigation of the open spaces even during dry spells.

A complete list of all funded projects is available at: https://www.z-u-g.org/fileadmin/zug/Dateien/Foerderprorgamme/AnpaSo/AnpaSo_Projektliste_Aug2023.pdf

Other impact indicators

1. For the expenditure year 2022:

In total, funding was disbursed to 368 projects and 142 approvals were granted for disbursement in subsequent years.

Of these:

- 248 projects for which funding was disbursed and 77 funding approvals fell under the AnpaSo funding guidelines
- 115 projects for which funding was disbursed and 65 funding approvals fell under the DAS funding guidelines
- 5 additional projects (contract awards) received funding outside of the two funding guidelines in 2022.

2. For the expenditure year 2023:

In total, funding was disbursed to 358 projects and 44 approvals were granted for disbursement in subsequent years.

Of these:

- 119 projects for which funding was disbursed and 6 funding approvals fell under the AnpaSo funding guidelines
- 233 projects for which funding was disbursed and 38 funding approvals fell under the DAS funding guidelines
- 6 additional projects (contract awards) received funding outside of the two funding guidelines in 2023

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3.2.3. Subsidies for organisations in the areas of environmental protection and nature conservation

	2022	2023
Budget chapter and item:	1601 685 04	
Eligible expenditures:	€8.7 million	€12.2 million
GHG emission reduction:	Not available	Not available
Projects:	155	147
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) c) d) e) f)	
Assumptions and limitations: --		
Links: --		

The purpose of this budget item is to provide funding to organisations working in the area of environmental protection and nature conservation. This includes funding for standardisation activities; project funding in the areas of chemical hazard assessment, environmental awareness and environmental action; and institutional funding for the German League for Nature and Environment (DNR) as an umbrella organisation and for the Association of German Engineers (VDI) on behalf of the VDI/DIN Commission on Air Pollution Prevention (KRdL). The eligible expenditures of the budget item are mainly distributed among the following programme areas. Representative examples are then described below.

Project name	Eligible expenditures (in € million) 2022	2023
Funding for environmental organisations	4.4	7.0
Support for standardisation activities	2.0	2.2
Projects to identify and assess chemicals in need of regulation	0.5	-
Association of German Engineers (VDI) on behalf of the VDI/DIN Commission on Air Pollution Prevention	1.6	1.6
Transformation Pathways Towards a Regenerative Built Environment (ReBuilt)	-	1.3
German Sustainable Building Award	0.2	0.2

Project: Cool Markets for the Climate (*Coole Märkte fürs Klima*) – sustainability tour for climate-friendly and sustainable events

The Cool Markets project launched a participatory process to facilitate information-sharing and networking among all stakeholders involved in organising events, including representatives from civil society. A nationwide series of workshops addressed five key action areas for sustainable events: waste, mobility, catering/procurement, energy and water/sanitation.

Markets, festivals, open-air events and a wide range of other commercial, non-commercial and private events contribute to human-induced climate change due to their consumption of resources. Travel to and from events is a major source of carbon emissions. Most events involve a significant amount of excess energy and water consumption, and venues are generally left with tremendous volumes of waste, which consists mainly of disposable packaging and giveaways.

The workshop outcomes were made available as documentary videos and accompanied by public outreach in various media as well as the publication of related information material. Organisers were also encouraged to develop ideas of their own or implement projects/campaigns in a national civil society competition.[40]

Project: City Meets Nature (*Stadt trifft Natur*) – national agenda and local challenge

Urban nature is diverse and includes green spaces, trees, greened buildings, and habitats for plants and animals. Its functions are equally diverse: urban nature improves quality of life and brings people into contact with and thus fosters their appreciation of nature. The new EU Biodiversity Strategy that was adopted in May 2020 sets out objectives and measures to protect urban nature. These objectives and measures are targeted towards the local level and thus directly address local authorities. Taking up this more localised approach, the project's aim was to pool the experiences gained from the implementation of the previous EU Biodiversity Strategy up to the year 2020 and from Germany's National Biodiversity Strategy, and then to use these lessons as a basis for implementing the new strategy in urban areas while also promoting the further development of regional activities by embedding them in a supra-regional context.

To this end, people involved in urban nature conservation were provided with additional training in order to disseminate the strategy's objectives at local level, in cooperation with local authority decision-makers. One of the project's priorities was to identify the EU Biodiversity Strategy's objectives and to communicate the key points to urban nature conservation practitioners. In regional workshops, the objectives were adapted to specific local needs in order to support local implementation of the EU Biodiversity Strategy. Regular information-sharing and networking using online formats helped the various groups incorporate the EU Biodiversity Strategy's objectives into local urban nature conservation efforts on a lasting basis. Input from civil society stakeholders involved in local biodiversity strategies was also used to further develop the urban nature components of the National Biodiversity Diversity.[41]

Institutional funding: Association of German Engineers (VDI) on behalf of the VDI/DIN Commission on Air Pollution Prevention

The Düsseldorf-based Association of German Engineers (*Verein Deutscher Ingenieure*, or VDI) is an independent non-profit technical/scientific association that – in cooperation with the German Institute for Standardization (*Deutsches Institut für Normung*, or DIN) – manages the Commission on Air Pollution Prevention (*Kommission Reinhaltung der Luft*, or KRdL).

The commission provides support to the BMUV in the complex field of air pollution

[40] https://www.umweltbundesamt.de/das-uba/was-wir-tun/foerdern-beraten/verbaendefoerderung/projektfoerderungen-projekttraeger/coole-maerkte-fuers-klima-die-nachhaltigkeitstour

[41] https://www.bfn.de/projektsteckbriefe/stadt-trifft-natur-nationale-aufgabe-und-lokale-herausforderung

control in accordance with section 1 of the Federal Pollution Control Act (*Bundes-Immissionsschutzgesetz*), especially in connection with national, European and international technical rules on air pollution control. In this way, it helps to assert Germany's strong interest in transferring Germany's high level of environmental protection to the European and international levels. Working independently and in cooperation with all relevant stakeholders (public authorities, the scientific community and industry), the commission determines the current state of play in science and technology and converts its findings into standards and guidelines.

The commission formulates VDI guidelines and DIN standards (VDI/DIN at the national level, CEN at the European level, and ISO at the international level) in the following four policy areas:

- Environmental protection technology, especially for purposes of emissions reduction (including integrated approaches that incorporate waste prevention, recycling and waste heat recovery), waste gas purification and cost accounting
- Environmental meteorology, especially air pollution, meteorological measurements, interactions between atmosphere and surfaces, applied climatology
- Environmental quality, especially the effects of air pollutants on humans, animals, soil, plants and materials
- Environmental metrology, emissions measurement technology, measurement planning, analysis of emissions and indoor air measurements, quality assurance of findings

The standards and guidelines are integrated into legislation and executive branch actions. Furthermore, as draft DIN standards, they are fed into European and international standard-setting processes.

DIN's Environmental Protection Helpdesk (*Koordinierungsstelle Umweltschutz*), which was established with support from the BMUV, plays a key role in ensuring that standard-setting processes pay greater attention to environmental priorities. The Helpdesk's steering committee includes representatives from government environmental authorities, environmental associations, industry, consumer bodies and science. Its supervisory board – which includes representatives from the BMUV, the Federal Environment Agency and DIN – helps to set the Helpdesk's policy agenda and improve its overall efficiency. The Helpdesk recently added a new advisory board that pools standard-setting activities specifically targeted towards circular economies.

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3.2.4. Investments to reduce pollution (Environmental Innovation Programme, Germany)

	2022	2023
Budget chapter and item:	1601 892 01	
Eligible expenditures:	€23.2 million	€23.2 million
GHG emission reduction:	See examples	See examples
Ongoing projects (total):	52	55
Of these, number of newly approved projects:	10	16
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) c) d) e)	

Assumptions and limitations: Investment subsidies from the Environmental Innovation Programme are generally limited to a maximum of €7.5 million. Projects are multi-year and are not co-financed by third parties.

Links: https://www.umweltinnovationsprogramm.de/

Since 1979, the Environmental Innovation Programme (*Umweltinnovationsprogramm*) has helped companies to put innovative, climate-friendly technologies into practice and to demonstrate that industrial processes and production can combine environmental and economic interests. Over 800 projects have received funding since the programme's inception. In the last 16 years alone, the funded projects have saved a total of around 2.8 million tonnes of CO_2e.[42]

A total of 52 projects received funding in 2022. Of these, 10 were newly approved. In 2023, 55 projects received funding, including 16 newly approved projects. For each year, the five projects that received the largest amount of actually disbursed funding are described below.[43]

[42] As of 3 March 2025.

[43] As of 3 March 2025; regularly updated figures are available on the Environmental Innovation Programme's website.

Project name (click on the project name to visit the website)	**Eligible expenditures (in € million)**	**Duration**	**GHG emission reduction (in t CO_2e p.a.)**	**Additional impact indicators**
2022				
Resource-efficient plant for the production of self-supporting wall elements made of cross-laminated timber with waste timber content	4.0	2020–2024	341	Resource efficiency: about 10,499 m^3 of cross-laminated timber saved
NetFroBio: the carbon-free, grid-friendly organic factory	2.0	2021–present (expected: until end-2026)	6,077	Resource efficiency and energy savings: Compared with conventional methods, 69% less energy and only one-tenth of the usual amount of water is needed.
Efficient, chromium(vi)-free galvanisation of plastics for the automotive industry	1.8	2021–2023	119	Resource efficiency: about 15.6 tonnes p.a. of chromosulfuric acid saved
Environmentally-friendly production of energy-efficient refrigerators and freezers using innovative vacuum technology	1.3	2021–present (expected: until end-2025)	Not available	Resource efficiency and energy savings: Appliance use: about 50% energy and CO_2 savings compared with old appliances; appliance production: about 44% energy and CO_2 savings compared with conventional production methods
Resource-efficient production of high-performance nanocellular polystyrene insulation	1.2	2020–2023	10,000	Not available
2023				
First industrial-scale use of power-to-liquid technology in Germany	4.0	2022–present (expected: until end-2025)	8,200	Not available
RDE-ICPF project: new low-carbon (LCE) and low-NO_x (LNO_x) glass-melting and production process for pharmaceutical and high-quality food containers	3.4	2021–present (expected: until end-2027)	22,000	Not available
NetFroBio: the carbon-free, grid-friendly organic factory	2.2	2021–present (expected: until end-2026)	6,077	Resource efficiency and energy savings: Compared with conventional methods, 69% less energy and only one-tenth of the usual amount of water is needed.

Project name (click on the project name to visit the website)	**Eligible expenditures (in € million)**	**Duration**	**GHG emission reduction (in t CO_2e p.a.)**	**Additional impact indicators**
Inline digital printing of corrugated cardboard in real time using the RSR (recovered sludge resources) process	1.4	2019–present (expected: until end-2025)	4,841	Resource efficiency: about 5,500 tonnes of paper saved
First-ever use of a system to recycle special-grade, hard-to-dissolve pulp for the purpose of producing bright white office paper	1.1	2022–2023	4,470	Resource efficiency: about 1.2 million m^3 of water saved

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3.2.5. Research, studies, etc. [in the area of nature conservation]

	2022	2023
Budget chapter and item:	1604 544 01	
Eligible expenditures:	€12.8 million	€14.2 million
GHG emission reduction:	Pursues other objectives	Pursues other objectives
Projects:	49	59
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	 f)	

Assumptions and limitations: --

Links:
https://www.bmuv.de/fileadmin/Daten_BMU/Download_PDF/Forschung/ressortforschungsplan_gesamt_2022_bf.pdf
https://www.bmuv.de/fileadmin/Daten_BMU/Download_PDF/Forschung/ressortforschungsplan_gesamt_2023_bf.pdf

Environmental policy action, the development of strategies and concepts, the assessment of environmental impacts and substance risks, and the observation of social, economic and technological trends all require a solid science-based decision-making foundation. Environmental rules and regulations have to be reviewed and revised, and ongoing environmental programmes and approaches must be accompanied by research. By bridging the gap between science and policymaking, the research conducted and commissioned by the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) makes a significant contribution in this respect. This research is generally geared towards helping the ministry and its higher federal authorities perform their tasks.

The ministerial research incorporated into Green German Federal securities is divided into the areas of **environmental protection and climate action** (1601 544 01) and **nature conservation** (1604 544 01).

The eligible expenditures of the budget item for nature conservation (1604 544 01) are distributed among the following programme areas. Three major areas are described below by way of example. Further descriptions of the research areas can be found in the linked BMUV Environmental Research Plan.

Research area	Number of planned new projects	
	2022	2023
General issues of nature conservation policy	5	3
Methodologies and instruments for the protection and sustainable use of nature and biodiversity	8	18
National and international species conservation	5	10
National and international protection of ecosystems and habitats	5	6
Integration of nature and biodiversity into other policy areas	17	10
Nature conservation and society	3	3
Nature conservation research accompanying the energy transition	6	9

Brief descriptions of key programmes:

General issues of nature conservation policy

Research on general issues of nature conservation policy supports, among other things, the implementation of the National Biodiversity Strategy. In addition, this research investigates the economic value of ecosystems, ecosystem services and biodiversity, and then links relevant findings to the system of environmental economic accounting. In this way, the value of nature is taken into account in value creation. Support is also provided for international bodies, such as the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES).

Methodologies and instruments for the protection and sustainable use of nature and biodiversity

Methodology development activities focus mainly on developing and testing components that can be used to build a more comprehensive biodiversity monitoring system. In addition, landscape planning instruments and FFH impact assessments are further developed and concepts for "green infrastructure" are operationalised. Research is conducted into the nature-friendly use of floodplains and peatlands, and instruments are developed for surveying, protecting and developing urban nature.

National and international species conservation

In the area of national and international species conservation, the BMUV's ministerial research focuses on insect populations and distributions, the causes of insect die-off and insect conservation measures. Internationally, this research also contributes to the improvement of instruments for implementing the Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and to EU dossiers on subjects such as invasive species.

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3.3. Aerospace, energy, transport and digitalisation

3.3.1. Maritime technologies, research, development and innovation

	2022	2023
Budget chapter and item:	0901 683 12	
Eligible expenditures:	€17.0 million	€22.9 million
GHG emission reduction:	Not available	Not available
Projects:	177	189
Beneficiaries:	109	118
Funding share:	33%	33%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	e)

Assumptions and limitations: In general, project duration is three years. Therefore the funding share is stated as 33%. There is no third-party financing.

Links:
https://www.bundesanzeiger.de/pub/publication/U1RaUGygxl7HYjdT2Er/content/U1RaUGygxl7HYjdT2Er/BAnz%20AT%2030.08.2023%20B2.pdf?inline

Under the funding announcement for the Maritime Research Programme, which entered into force on 1 January 2018, the Federal Ministry for Economic Affairs and Climate Action (BMWK) funds research and development projects with applications in the maritime sector in Germany. The federal government updated the funding guidelines on 14 August 2023 and again on 20 June 2024. The Maritime Research Programme aims to strengthen innovation in Germany's internationally competitive maritime sector by promoting innovative maritime technology solutions and applications. It also seeks to secure and expand future-proof jobs in Germany while advancing climate action and environmental protection.

This budget item is used to finance five of the Maritime Research Programme's funding priorities:

- MARITIME.green (environmental protection)
- MARITIME.smart (digitalisation)
- MARITIME.safe (safety)
- MARITIME.value (resources)
- MARITIME.zeroGHG (climate-neutral shipping) (only as of the new funding guidelines of 14 August 2023, updated by the funding guidelines of 20 June 2024)

Funding is provided for application-oriented projects for research, development and innovation (R&D&I).

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3.3.2. Development of digital technologies

	2022	2023
Budget chapter and item:		0901 683 21
Eligible expenditures:		€9.9 million
GHG emission reduction:		Not available
Joint projects:		21
Beneficiaries:		121
Funding share:		64%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	d) e)

Assumptions and limitations: The projects normally have a minimum duration of three years but may be extended in individual cases if doing so increases the likelihood of achieving the project objectives. As project funding began in 2023, the project outcomes are not yet available or have yet to be applied in practice.

Links:
https://www.digitale-technologien.de/DT/Navigation/EN/Foerderaufrufe/Archiv/green_tech/green_tech.html

The technology programme GreenTech Innovation Competition (*GreenTech Innovationswettbewerb*) is receiving total funding of €72.5 million over the 2023–2026 funding period. The programme includes 21 funded projects that were selected in a competitive process following a call for funding. The 21 projects were launched on 1 May 2023. Of the total funding amount, approximately €9.9 million are eligible expenditures for 2023.

The core objective of the technology programme is to expedite the use of digital technologies as the key to aligning economic and environmental interests, thereby making a significant contribution to sustainable development in line with the United Nations 2030 Agenda. Digital technologies can contribute to increasing energy and resource efficiency in all sectors and hence to environmental protection and climate action. Through the development, testing and application of platforms, tools, methods, business models, usage models and standards for the expansion and integration of digital technologies in the area of sustainability, the projects should make a decisive contribution to the green transformation of the economy, particularly with regard to climate action and environmental protection. They should also feed into the respective sectors that they are addressing and create spillover effects. The aim is to promote projects that enable a transfer of knowledge and technology to small and medium-sized enterprises.

Project examples	Brief description	Number of beneficiaries	Eligible expenditures (in € million)	Multi-year funding (in € million)
CliCE-DiPP	Climate-neutral Circular Economy enabled by Digital Product Carbon Passport: Development of a digital carbon product passport designed to be used both within individual companies and across different companies in order to make production and production networks environmentally and economically sustainable.	8	1.24	5.32
de:karb	Development of a platform for the identification and reduction of CO_2 emissions along the entire value chain of the steel producing and processing sector, enabling the carbon footprint of steel products in the value chain to be tracked and optimised.	7	0.56	5.95
ESCADE	Energy-Efficient Large-Scale Artificial Intelligence for Sustainable Data Centers: The aim of this project is to improve the sustainability balance of AI systems in data centres by developing an ecosystem for AI use cases with proven sustainability metrics. To this end, innovative AI services are to be operated in data centres that are optimised for sustainability.	6	0.52	3.75
fashionsort.ai	Development of automated and AI-based sorting solutions for the sustainable re-use of textiles. The aim is drive forward textile circularity through the re-use and high-quality recycling of old clothes. A digital sorting solution with a scanning system (cameras and RFID scanners) is being developed for this purpose.	3	0.30	2.46

The following section describes the results achieved to date in four of the GreenTech Innovation Competition technology programme projects. They illustrate the programme's high level of innovation and wide range of applications.

ESCADE

As one of the few projects dealing with the sustainability of digital technologies, the ESCADE project is a flagship project in this area of the funding call.

ESCADE is researching how the energy requirements of data centres can be reduced and the environmental footprint of AI applications improved through the use of pioneering hardware and software technologies. In addition to the use of neuromorphic chip technologies, the development of energy-efficient AI algorithms is a key objective. The goal is to develop climate-friendly AI applications that are aligned with sustainability principles and that can be operated in energy-efficient data centres.

Demonstration and trial versions are presented regularly at events such as the Hannover Messe and the Tage der digitalen Technologien (Digital Technology Days). In addition, recycling strategies are taken into account right from the start.

Fashionsort.ai

The goal of the fashionsort.ai project is to drive forward textile circularity by optimising the re-use and high-quality recycling of old clothes. To this end, a digital sorting solution is being developed that uses a scanner system to detect textiles on a conveyor belt using cameras and RFID scanners. A combination of artificial intelligence and data from digital product passports is used to precisely differentiate between product attributes. The improved sorting quality compared to today's manual processes opens up new market opportunities in the areas of second-hand clothing, recommerce, repair, upcycling and recycling. The project aims to deliver essential building blocks to meet the objectives of the EU Strategy for Sustainable and Circular Textiles and the requirement under the revised Waste Framework Directive to establish separate collection systems for textiles.

This project contributes significantly to the visibility of the GreenTech Innovation Competition, not only because the topic is very accessible and but also because a trial version is already available. The project's automated sorting solution makes the recycling of old clothes using high-quality R-strategies possible in the first place. The project thus represents an important step towards achieving a functioning circular textile sector.

CliCE:DiPP – Climate-neutral Circular Economy enabled by Digital Product Carbon Pass

The objective of the CliCE-DiPP research project is to develop a digital carbon product passport that can be used both within individual companies and across different companies to make production and production networks environmentally and economically sustainable. The digital carbon product passport forms the basis for determining all necessary process and product data, such as resource consumption, energy consumption and process parameters, across the entire value chain and the entire life cycle of a product.

Assistant systems will help employees steer the overall equipment effectiveness (OEE). In order to enable energy- and resource-efficient shop floor management (SFM), trial versions are first piloted and validated in the learning factories of research institutes before being transferred to real use cases in companies.

CliCE-DiPP is therefore one of the first projects to use a digital product passport to record all relevant sustainability and energy data with the aim of making the entire value chain more sustainable.

de:karb

The de:karb project is developing a platform that makes it possible to track and optimise the carbon footprint of steel products. A way of connecting the platform to production control systems, machines and energy market data is also being developed.

The goal is a freely accessible online platform that companies can use to precisely measure the carbon footprint of their specific components. A company's knowledge of its own carbon footprint is the first step towards reducing emissions. The online platform will show which measures, at which stage of the production process, would result in the greatest reduction in emissions.

Creating CO_2 transparency across the entire value chain of the sheet-metal production and processing industry makes it possible to determine the carbon footprint of individual components and supports the EU's policy objectives to reduce carbon emissions. The central role of the steel industry in the environmental transformation of the economy makes this a flagship project and sets an example for other sectors to follow.

Summary:

It is not possible to determine the exact reduction in GHG emissions, since the funded

projects cover very diverse applications and use different digital technologies to achieve their project goals. The projected savings of the individual projects vary considerably and are only estimates.

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3.3.3. Research funding for civil aviation technology projects – funding of individual projects

	2022	2023
Budget chapter and item:	0901 683 31	
Eligible expenditures:	€114.9 million	€153.3 million
GHG emission reduction:	Not available	Not available
Projects:	578	746
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	d) e)

Assumptions and limitations: The projects normally have a minimum duration of 3¼ years but may be extended in individual cases if doing so increases the likelihood of achieving the project objectives. As project funding began in 2020 and 2021 (LuFo VI-1 and VI-2), the project outcomes are not yet available or have yet to be applied in practice.

Links:
https://www.dlr.de/en/pt-lf

Funding objective

The primary objective of the federal aviation research programme LuFo Climate is to significantly reduce the aviation industry's impact on the climate caused by aviation-induced greenhouse gas emissions and non-CO_2 effects. In order to meet the requirements and targets of the Paris Agreement, the EU Commission's Green Deal and the German government's Climate Action Act, and to strengthen public acceptance, intensive efforts need to be made in coordination with the EU's funding programmes (Horizon Europe, Clean Aviation) and other European countries towards achieving climate-neutral aviation and further reducing material and resource consumption in production processes. The expected increase in air traffic and the integration of unmanned aircraft into existing airspace can only be handled in future with more efficient and climate-neutral air transport and production systems.

In view of Germany's ambitious climate goals, technological solutions for climate-neutral aircraft are urgently needed to make aviation more climate-friendly and climate neutral by 2050. In addition to the advancements that have already been made, totally new, disruptive technologies are needed to address this huge challenge. Hydrogen and sustainable aviation fuel (SAF), as new sources of energy, are the starting point for the decarbonisation of all types of aircraft. They will enable new forms of propulsion such as fuel cells as well as hybrid systems. To compensate for the low energy content of hydrogen per volume and the generally higher costs of green hydrogen and SAF compared to conventional kerosene, improvements to all aircraft subsystems, including aerodynamics, construction methods, lightweight construction and all electronic systems, are of vital importance. These issues are being addressed through the federal aviation research programme LuFo Climate.

Target achievement and funding efficiency

Outcomes of the aviation research programme (LuFo) are already leading to massive carbon savings, both in operations (through improvements in propulsion technology and aerodynamics) and through adjustments to air traffic routing. However, further research efforts to optimise aircraft overall in all sub-areas are essential to achieving climate targets and at least partially offsetting the generally

higher costs of green hydrogen and SAF compared to fossil kerosene.

The funding measure combines climate change mitigation with industrial policy goals. It strengthens Germany as an aviation hub and opens up the opportunity for the German aviation industry to enhance its competitiveness with innovative, low-emission, climate-friendly technologies and to tap into new export markets. The measure also contributes to achieving the ambitious emission reduction goals adopted in the Flightpath 2050 research and innovation strategy jointly developed by the European Commission and the aerospace industry. The target is a 75% reduction in CO_2 emissions and a 90% reduction in NO_x emissions per passenger kilometre (pkm) by 2050 (compared to 2000).

The technologies developed will be used in particular in a successor programme for the A320 family of aircraft for short and medium-haul flights. The new aircraft are scheduled to enter the market from 2035 onwards. These technologies continue to be the basis of Airbus's hybrid-electric ZeroE programme and the programmes of other OEMs. The developed technologies will also be used for long-haul aircraft in the future.

Air transport is a global phenomenon, and technologies researched and developed in Germany that reach sufficient maturity have the potential to be adopted in the aviation sector worldwide. For this reason, the programme looks beyond domestic German aviation to include an international and global dimension. 2050 is the time horizon, because long development and market penetration cycles mean that in some cases the potential in air transport can only be realised with a considerable time lag. The reported reduction potential relates to CO_2 emissions per se and CO_2 equivalents in terms of expected emissions assuming the "with existing measures" (WEM) scenario from the federal government's 2021 projection report. CO_2 equivalents are used so that the overall climate impact of air transport is adequately taken into account and can be efficiently addressed with reduction measures.

Technologies funded and operational measures enhanced through the LuFo programme have a cumulative savings potential of 19 billion tonnes of CO_2 equivalents or 500 million tonnes of CO_2 by 2030 and 206 billion tonnes of CO_2 equivalents or 24.7 billion tonnes of CO_2 by 2050. The potential annual savings relative to the "with existing measures" scenario rises to 75% for CO_2 equivalents and 16% for CO_2 by 2030 (94% and 96% respectively by 2050).

The introduction of new technologies (engines and airframes) accounts for the largest relative share of the potential savings by 2050 at around 42%, followed by the introduction of operational measures (24%) and savings from new fuels such as hydrogen (29%).

The aviation research programme is focused primarily on new technologies (engines and airframes) as key enablers for the introduction of new climate-neutral fuels such as hydrogen, meaning that, cumulatively speaking, up to 42% of the above-mentioned potential savings are addressed by the "research funding for civil aviation technology projects" budget item.

Eligible research projects

- In 2020, 284 eligible research projects were launched with total funding of approximately €202 million (LuFo VI-1).
- In 2021, 119 eligible research projects were launched with total funding of approximately €90 million (LuFo VI-1 and LuFo VI-2).
- In 2022, 208 eligible research projects were added with total funding of approximately €268 million (LuFo VI-2).
- In 2023, 160 eligible research projects were added with total funding of approximately €168 million (LuFo VI-3).

Out of these projects, those with eligible expenditures in 2022 and 2023 were taken into account.

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3.3.4. National programme for space and innovation – R&D projects

	2022	2023
Budget chapter and item:	0901 683 32	
Eligible expenditures:	€46.3 million	€11.4 million
GHG emission reduction:	Not available	Not available
Events and no. of participants:	7 events with around 350 participants in connection with EnMAP, 7 events with a total of around 200 participants in connection with MERLIN, around 750 participants in Hyperedu online courses	11 events with around 470 participants in connection with EnMAP, 15 events with a total of around 400 participants in connection with MERLIN, around 750 participants in Hyperedu online courses
EnMAP publications:	656	781
MERLIN publications:	6	5
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) c) e) f)	
Assumptions and limitations: --		
Links: https://www.enmap.org/ https://www.enmap.org/science/publications/ https://www.enmap.org/events_education/hyperedu/ https://www.dlr.de/en/ar/topics-missions/earth-climate/climate/merlin-the-franco-german-climate-mission https://merlin-methane.space/		

MERLIN (Methane Remote Sensing Lidar Mission) is a German-French cooperation project between the two space agencies CNES and DLR and was selected as a project in 2010. The MERLIN satellite launch is scheduled for 2029. Its purpose is to monitor methane, a greenhouse gas, in the Earth's atmosphere. One of the aims is to identify methane sources and sinks. The satellite was under construction in 2022 and 2023. Six publications can be reported for 2022 and five publications for 2023.

EnMAP was launched from Cape Canaveral on 1 April 2022. The mission has an expected operational lifetime of at least five years. The main objective is to study a wide range of ecosystems on the Earth's surface. 656 publications can be reported for 2022 and 781 publications for 2023. In addition to technological developments, the missions will enable a range of scientific, commercial and government applications once they become operational. While payments to the satellite manufacturer and federal grants for operating costs are financed from the budget item listed above, the DLR's own contributions are financed from the German Aerospace Center (DLR) budget items 0901 685 31 and 0901 894 31.

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3.3.5. German Aerospace Center (DLR) – operation and investments

	2022	2023
Budget chapter and item:	0901 685 31 and 0901 894 31	
Eligible expenditures:	€492.0 million	€524.6 million
GHG emission reduction:	Not available	Not available
Projects:	337	367
Scientific publications:	1,645	1,475
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: The sustainability effects of research and development projects are not directly quantifiable or scalable for the entire sector, notably because the utilisation of research results is uncertain at the time of expenditure.

Links:
https://www.dlr.de/en

In its research areas of aerospace, energy, transport and digitalisation, the DLR conducts research into a range of topics that contribute to the German government's climate goals:

Research area	Eligible expenditures (in € million) 2022	2023	Topics
Aeronautics	156.3	166.5	Climate research with impact assessments; eco-efficient production methods with circular economy methods; climate-efficient and climate-neutral fuels and drive systems; climate-optimised air traffic routing; designing ultra-efficient aircraft; noise reduction through optimised flight procedures, aircraft designs and technologies
Space	159.3	162.1	Earth observation satellites to quantify biomass and emissions (e.g. CO_2, methane); closing material cycles; emission prevention in space (e.g. transport, materials); green/new forms of fuel: future fuels; battery development in the DLReps project; solar panels with supercapacitators (HySeS); hydrogen handling, storage, tanks
Energy	88.2	102.4	Solar and wind energy; green hydrogen and other synthetic sustainable fuels; energy storage and transportation; decarbonisation of industry; energy system analysis and sector coupling to optimise energy systems

Research area	Eligible expenditures (in € million) 2022	2023	Topics
Transport	88.3	93.5	Development of new mobility concepts focused on climate action and resource protection; supporting the industry by decarbonising transport through the integration of new drive systems and renewable energy in vehicles and the transport system; digitalisation of mobility through automation and "mobility as a service" concepts to protect resources, improve resilience of the transport system and reduce land use

Examples of projects from the aviation sector

Hydrogen Tank Certification (HyTaZer) project – hydrogen storage systems for the mobility sector

Using hydrogen is a promising way to reduce carbon emissions. The HYTAZER project is developing technologies to store hydrogen and bundles expertise in the area of hydrogen storage in various DLR programmes. Using a building block approach and model-based certification, a certification strategy has been defined featuring the most important aspects of cryogenic hydrogen storage systems: the hydrogen distribution system, material strength, leakage, thermal behaviour, crash safety and bonding technology. For example, research has been conducted into the crash safety of large liquid hydrogen tanks, which are being developed for installation in the rear of aircraft fuselages. Crash safety requirements and detailed qualification strategies have not yet been universally agreed on and are not yet widely available. Based on current and expected requirements, around 20 crash concepts have been evaluated. The selected concepts are tested by means of a highly dynamic, nonlinear finite element analysis with the help of models of fuselage sections and complete fuselages. In the simulation, the selected concept withstands the defined vertical and horizontal load cases without compromising the internal tank structure. In addition, a qualification strategy for the crashworthiness of liquid hydrogen tanks has been developed and shared with the European Union Aviation Safety Agency (EASA). The HYTAZER project has also developed key competencies for the simulation, manufacturing and evaluation of hydrogen tank systems that can be used to validate the simulation tools with experimental results and applied to various mobility applications in the aviation, rail transport and shipping sectors.

Hydrogen tank – core element of new drive systems – DLR lightweight systems: https://leichtbau.dlr.de/der-wasserstofftank-kernelement-neuer-antriebe

DLR project EXACT

The project Exploration of Electric Aircraft Concepts and Technologies (EXACT) is a large and comprehensive sustainable aviation study undertaken by the German Aerospace Center (DLR). The aim of EXACT is to find out how aviation's climate impact can be drastically reduced while maintaining economic competitiveness. EXACT brings together the expertise of 20 institutes specialising in the design of subcomponents, components, whole aircraft and air transport and energy systems, thus enabling highly detailed studies on aircraft design and a comprehensive assessment of these studies. This requires input from and effective cooperation between a large number of disciplines across different sectors – which is precisely one of DLR's key strengths. EXACT covers all aspects of the air transport system of the future as well as its

energy systems. This ranges from detailed aircraft strategies for the regional through to the ultra-long-distance segments to the production of energy sources from an economic and environmental perspective. The project also covers air traffic forecasting, fleet assignment and global economic and environmental life-cycle simulations to enable a final global assessment and decision-making. An aircraft's entire life cycle, its components and its energy source is also taken into consideration. In this way, EXACT takes into account the aviation sector's overall impact on the climate.

https://exact-dlr.de/

Examples of projects from the aerospace sector

Polar Monitor project – quantifying change processes in polar regions

Comprehensive observation of snow cover, glaciers and inland ice – including mass balance, flow velocity and ice shelf fronts – is crucial to understanding their impact on sea levels, water availability and the global radiation balance. These were the challenges addressed by the Polar Monitor project, which ran from 2020 to 2022.

During the final year, the work of the current project was completed and preparations for a follow-up project were initiated. A new fully automatic method for vertical co-registration with a reference elevation model has been successfully implemented in the operational processor for the TanDEM-X mission (Integrated TanDEM-X Processor (ITP)). In addition, the Greenland aerial survey was carried out and evaluated, the development of new measurement methods was advanced, and research results on permafrost and on the aerial survey of the Aletsch glacier were published. The IceLines service and Global Snow Pack service were finally implemented and are now freely available on the DLR GeoService (monthly time series since 2014 based on Sentinel-1 data): https://geoservice.dlr.de/web/maps/eoc:icelines.

As a continuation of Polar Monitor, Polar Monitor II uses improved methods to observe the effects of global climate change and the resulting changes in snow cover, mass balances of glaciers and inland ice as well as the position of ice shelf / glacier fronts.

ReFEx project – reusability in space transportation

Introducing reusable space transport systems not only has huge cost-cutting potential, it also reduces the impact on the environment (circular economy approach). The DLR is therefore researching various technologies for the return of space transport systems. One of the projects, ReFEx, which was launched in 2018 and runs to 2026, aims to test controlled return flights in the hypersonic to transonic range.

In 2022, the structural model and engineering model integration campaigns were further advanced, essential tests were completed and structures were finalised. Discussions were started with regard to the planned launch.

A fully integrated structural model of ReFEx was successfully integrated in 2023, thereby verifying the integration sequence and procedures. Numerous tests were also carried out on the structure. The engineering models and some of the flight models of ReFEx's internal system were integrated on the Core Avionics System Test Bed (CAST) and successfully tested. Preparations for the launch continued to be driven forward. In addition, work on the further development of the hybrid navigation system (HNS) was continued on both the hardware and software sides. Particular challenges include the fusion of very diverse sensor data and processing these data points from a GNC perspective in real time. This is essential for a controlled flight and in particular for the landing phase.

EnMAP project – start of the satellite mission

The objective of the German hyperspectral satellite mission EnMAP (Environmental Mapping and Analysis Program) is to globally monitor and characterise the Earth's environment. EnMAP measures geochemical, biochemical and biophysical variables and provides information on the status and development of terrestrial and aquatic ecosystems.

The EnMAP satellite was successfully launched into orbit in April 2022. The mission has been in routine operation since the end of 2022 and is delivering scientific data.

In 2023, the EnMAP satellite mission completed its first full year of routine operation. The project successfully carried out all tasks related to the operation of the mission, from controlling and monitoring the satellite to acquiring images, downlinking and processing, and distributing the data to users. Since the satellite launch in April 2022, the mission has carried out more than 8,456 requested Earth observations, resulting in more than 56,000 Earth observation products and 198 calibration products, which have been processed and stored in the mission's long-term archive. This makes EnMAP an extremely valuable source of data for global environmental and climate impact research.

Examples of projects from the energy sector

NeoFuels project

The DLR NeoFuels project (project duration 2022–2025) bundles research on climate-neutral fuels from the energy, transport, aviation and aerospace sectors. The focus is on climate neutrality, performance and the economic efficiency of our mobility and energy supply.

The project aims to further close the gap between demonstration and commercial implementation in the aviation, aerospace, transport and energy sectors. A key objective is to comprehensively map biofuels and synfuels in a practical and methodical way, from the source through to production and utilisation, including their environmental impact. To achieve this, the project leverages and brings together the expertise of all participating institutions to analyse and where possible optimise every sub-process.

One of the project's key findings is that all available technologies need to be leveraged to achieve climate goals. Certain modes of transport, such as road transport, can already be electrified to a large extent. However, in the medium to long term, liquid energy sources will remain indispensable in other sectors with high performance and energy demands, such as the aviation, aerospace, shipping and heavy-goods transport sectors. Consequently, the project investigates both sustainable fuels derived from biogenic sources (biofuels) and synthetically produced fuels (synfuels) and incorporates them into existing strategies.

https://www.dlr.de/en/research-and-transfer/projects-and-missions/neofuels

SoGuR project

To efficiently manage increasing fluctuations in the feed-in from renewable energy sources into the grid, a certain degree of flexibility is required in energy procurement on the consumption side. The key question addressed by the DLR project SoGuR – Self-Optimising Buildings and Urban Spaces (*SoGuR – Selbstoptimierende Gebäude und urbane Räume*) is therefore: how can decentralised energy systems be designed and operated optimally for consumers in terms of performance, capacity and dynamics, while taking into account economic, environmental and regulatory conditions as well as the surrounding energy system?

The goal of the project, which was launched in 2021 and ended in 2024, is to develop innovative methods for recording the building stock, for design optimisation and for forecasting-based energy management approaches in combination with methods to quickly balance out imbalances. These are validated in a computer model before being systematically tested. For this purpose, prototypical neighbourhoods are defined in the electricity and heating sectors as typical representations of settlement structures in Germany.

On the one hand, a machine learning-based method for classifying neighbourhood structures was developed and evaluated in this project. This method is based, among others, on GIS and census data and creates energy-demand time series as a basis for optimisations. This work forms the basis for the spin-off company heatbrAIn. On the other hand, the potential of decentralised flexibility to compensate for fluctuations in energy generation and consumption was determined. Among other things, a reduction in costs and

an increase in grid friendliness in an energy community was simulated using local real-time prices.

Examples of projects from the transport sector

"Focus Applications, Vehicle Structure, Powertrain and Energy Management" (FFAE) project

Whether bus or train: how can reliable and cost-effective electric mobility be achieved in public transport without losing range in winter? And how can vehicle concepts for public transport be achieved that are cost-effective, space-saving and resource- and payload efficient? High-performance thermal storage systems are an essential requirement, because they provide energy for vehicle heating at lower weight compared to batteries. DLR is conducting intense research on these storage systems based on metallic phase change materials. With this approach, high volumetric and gravimetric storage densities can be achieved. Thanks to their very high thermal conductivity, it is possible to achieve high charging and discharging performance with minimal technical effort. Avoiding melt-enclosure reactions is crucial for the successful application of metallic latent heat storage systems. This involves using DLR's unique research infrastructure to characterise liquid-solid interactions. The application focus is particularly on storage solutions for battery electric vehicles such as buses and trains.

Propulsion and Coupling (ProCo)

As part of the ProCo project, a modular and scalable system kit for alternative rail vehicle drives (Fuel Cell and Hybrid PowerPack, FCHPP) is being developed and demonstrated in collaboration with industry partners of the Europe's Rail initiative. The goal of ProCo is to support the railway industry in decarbonising rail transport by offering alternatives to the current diesel drives. Basic building blocks are used to provide rail vehicles with energy supply systems and architectures. To this end, it employs scalable subsystems as modules with defined interfaces. FCHPP is a system for designing a modular and scalable fuel cell and hybrid battery power pack to meet specific requirements. Work on the project ranges along the complete life-cycle from the development of methods and tools, to concepts and technologies, through to design and prototype demonstrations and the subsequent optimisation of energy distribution and life-cycle costs. As part of the Europe's Rail initiative, a hydrogen-powered multiple-unit train, developed on the basis of preliminary work carried out in the ProCo project, completed its first successful long-distance journey on the mountain railway from Zaragoza to Canfranc in the Pyrenees.

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3.3.6. Climate-neutral aviation

	2022	2023
Budget chapter and item:	6092 683 05	
Eligible expenditures:	€48.0 million	€157.6 million
GHG emission reduction:	Not available	Not available
Projects:	96	180
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: The projects normally have a minimum duration of 3¼ years but may be extended in individual cases if it increases the likelihood of achieving the project objectives. As project funding began in 2020 and 2021 (LuFo VI-1 and VI-2), the project outcomes are not yet available or have yet to be applied in practice.

Links:
https://www.dlr.de/en/pt-lf

Funding objective

The primary objective of the federal aviation research programme LuFo Climate is to significantly reduce the aviation industry's impact on the climate caused by aviation-induced greenhouse gas emissions and non-CO_2 effects. In order to meet the requirements and targets of the Paris Agreement, the EU Commission's Green Deal and the German government's Climate Action Act, and to strengthen public acceptance, intensive efforts need to be made in coordination with the EU's funding programmes (Horizon Europe, Clean Aviation) and other European countries towards achieving climate-neutral aviation and further reducing material and resource consumption in production processes. The expected increase in air traffic and the integration of unmanned aircraft into existing airspace can only be handled in future with more efficient and climate-neutral air transport and manufacturing systems.

Funding is provided for R&D projects with the aim of producing low-emission and, in the medium to long term, zero-emission (carbon-neutral) aircraft. The objective is to develop engineering solutions for an aircraft that emits no pollutants either in flight or on the ground. The path to zero-emission aviation will require substantial investment and major research efforts for technologies in all areas.

A key focus is the development of electric propulsion systems for primary flight power. Electric propulsion systems get their electrical energy from batteries, fuel cells or a combination of the two. Fuel cells are designed to run on zero-emission "green" hydrogen. Another technology option is the direct combustion of hydrogen in conventional gas turbines. The next major technological challenge is to develop technology for storing sufficient quantities of hydrogen. To ensure that the new propulsion system is not developed at the expense of functional aspects, special new aircraft configurations are needed to match the specific system characteristics. Deliberate use is made of design flexibility to enable the new technologies to be integrated well into the overall system. As a result, all subsystems have to be redeveloped for the new propulsion system.

Target achievement and funding efficiency

Outcomes of the aviation research programme (LuFo) are already leading to massive carbon savings, both in operations (through improvements in propulsion technology and aerodynamics) and through adjustments to air traffic routing. Hybrid-electric propulsion

technologies combined with alternative fuels or fuel cells, as well as hybrid-electric structures (cabin supply including avionics and emergency power supply), are contributing significantly to additional carbon emission reductions.

The developed technologies are the basis of Airbus's hybrid-electric ZeroE programme and the programmes of other OEMs.

Air transport is a global phenomenon, and technologies researched and developed in Germany that reach sufficient maturity have the potential to be adopted in the aviation sector worldwide. For this reason, the programme looks beyond domestic German aviation to include an international and global dimension. 2050 is the time horizon, because long development and market penetration cycles mean that in some cases the potential in air transport can only be realised with a considerable time lag. The reported reduction potential relates to CO_2 emissions per se and CO_2 equivalents in terms of expected emissions assuming the "with existing measures" (WEM) scenario from the federal government's 2021 projection report. CO_2 equivalents are used so that the overall climate impact of air transport is adequately taken into account and can be efficiently addressed with reduction measures.

Technologies funded and operational measures enhanced through the LuFo programme have a cumulative savings potential of 19 billion tonnes of CO_2 equivalents or 500 million tonnes of CO_2 by 2030 and 206 billion tonnes of CO_2 equivalents or 24.7 billion tonnes of CO_2 by 2050. The potential annual savings relative to the "with existing measures" scenario rises to 75% for CO_2 equivalents and 16% for CO_2 by 2030 (94% and 96% respectively by 2050).

The introduction of new technologies (engines and airframes) accounts for the largest relative share of the potential savings by 2050 at around 42%, followed by the introduction of operational measures (24%) and savings from new fuels such as hydrogen (29%).

Hybrid electric aviation primarily relates to the introduction of new technologies (engines and airframes) as a key enabler for the introduction of new climate-neutral fuels such as hydrogen, meaning that, cumulatively speaking, up to 71% of the above potential savings are addressed by the "hybrid electric aviation" budget item.

Eligible research projects

- In 2020, 50 eligible research projects were launched with total funding of approximately €202 million (LuFo VI-1).
- In 2021, 21 eligible research projects were launched with total funding of approximately €52 million (LuFo VI-1 and LuFo VI-2).
- In 2022, 40 eligible research projects were added with total funding of approximately €77 million (LuFo VI-2).
- In 2023, 80 eligible research projects were added with total funding of approximately €232 million (LuFo VI-3).

Out of these projects, those with eligible expenditures in 2022 and 2023 were taken into account.

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3.3.7. Funding for artificial intelligence (for environmental purposes)

	2022	2023
Budget chapter and item:	1601 686 02	
Eligible expenditures:	€15.8 million	€22.7 million
GHG emission reduction:	Not available	Not available
Projects (total):	22	22
Beneficiaries (total):	84	84
Funding share:	Up to 100%	Up to 100%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) d) e) f)	a) b) c) d) f)

Assumptions and limitations: Projects that have not yet been scaled and that are therefore evaluated or measured on the basis of their potential rather than their demonstrable impact are funded as innovation programmes.

Funding share:

- Green AI Hub: 100% federal funding
- AI flagship projects: The funding share varies from project to project (see table below)

Links:

https://www.green-ai-hub.de/en/

Interim evaluation of the impact of AI flagship projects: https://www.z-u-g.org/fileadmin/zug/Dateien/Foerderprorgamme/KI_Leuchttuerme/Evaluation-KI-Leuchttuerme-barrierefrei.pdf

Green-AI Hub Mittelstand initiative: Green-AI Hub Mittelstand is a pioneering initiative that promotes the use of AI to improve resource efficiency and material savings in SMEs. It develops practical and solution-oriented prototypical solutions for sustainable economic growth in collaboration with SMEs directly on site. By the end of 2025, the Green-AI Hub Mittelstand will have implemented up to 20 pilot applications.

Since 2019, the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection's **funding initiative "AI lighthouse projects for the environment, climate, nature and resources"** has been funding real-world model projects that harness AI to advance environmental protection, climate action and nature conservation. The projects deal with topics such as biodiversity, water management, climate change adaptation, marine conservation, sustainable consumption, sustainable tourism, resource efficiency, and the circular economy.

Lighthouse project	Eligible expenditures (in € million)		Brief description	Funding share:
	2022	2023		
I4C (01.01.2021 – 30.06.2024)	1.2	0.7	Intelligence for Cities: AI-based adaptation of cities to climate change – from data via predictions to decisions	100%
PlasticObs_plus (01.04.2022 – 30.06.2025)	0.5	0.7	Machine learning based on multisensor data from aircraft-based remote sensing to combat plastic waste in oceans and rivers	85.75%
CRTX (01.10.2020 – 31.03.2024)	0.4	0.3	AI-based processes for closing sustainable material cycles in the textile industry	91.97%
Cognitive Weeding (01.09.2021 – 31.12.2024)	1.0	1.0	Selective weed management with the help of artificial intelligence	84.65%
DC2Heat 01.08.2023 – 31.07.2026)	-	0.3	Data centre heat recovery with AI technologies	90.44%

The funding shares specified in the table apply in each case to the entire joint project and the entire time period. The AI lighthouse initiative is expected to fund an average of 86.04% of the total costs or expenditures of all R&D projects, although the share of funding varies funding recipient.

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3.4. Lightweight and other construction solutions

3.4.1. Technology transfer – lightweighting

- Technology transfer programme – lightweighting (only for 2022)
- Resource efficiency and substitution
- New construction technologies and materials for low-emission industry

	2022	2023
Budget chapter and item:	0901 683 15, 6092 686 15 and 6092 686 17	
Eligible expenditures:	€52.7 million	€80.2 million
GHG emission reduction:	8.32 million t CO_2e	13.36 million t CO_2e
Joint projects:	142	214
Funding share:	17.3%	16.3%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	d)

Assumptions and limitations:

GHG emission reduction: The "Technology transfer programme – lightweighting" funds research and development projects. Turning the project outcomes into marketable products and processes is not part of the R&D projects themselves, but takes place at a later stage. Due to the R&D nature of the projects and the associated uncertainties regarding their actual implementation in market-relevant products, it is only possible to estimate the potential reduction in greenhouse gases, so that the figures provided should be treated with caution. On a conservative estimate, it is assumed that only 10% of the projects will be commercialised. Data on potential GHG reductions is requested at various stages of each project in an accompanying monitoring programme. The potential reductions stated here are based on data requested at an early stage of the projects. It is expected that the monitoring data will become more accurate over time. The projects report on potential CHG reductions in the manufacturing phase, the usage phase and the end-of-life phase of products and materials. To obtain comparable data, the figures are requested at a short-to-medium-term interval after completion of the R&D projects. A summary analysis is applied for this purpose over a period of seven years after project completion.

On this basis, for the projects for which expenditures were incurred in 2022 and 2023, potential GHG reductions of 4.16 (2022) and 6.68 (2023) million tonnes of CO_2e are estimated for the industrial sector over a period of seven years after project completion. In addition to the reductions for the industrial sector, similar GHG reductions are forecast over the same period for the transport sector. This results in an estimated potential GHG reduction of 8.32 (2022) and 13.36 (2023) million tonnes of CO_2e for both sectors combined.

In an evaluation as part of the Immediate Climate Action Programme, an external expert consortium assessed the plausibility of the approach described above and the assumptions made.

Funding share: As a rule, funding is provided for joint projects with varying start and end dates. For the funding share, beneficiaries' eligible expenditures in 2022 and 2023 are first expressed as a percentage of the approved funding volume over the entire project duration. Funding contributed by the companies themselves was taken into account on the basis of the average funding rate of 68.6% and 67.9% respectively for projects running in 2022 and 2023. This means that 68.6% (2022) and 67.9% (2023) of the total of all project costs was met by the federal government and the remainder by the companies. This results in a funding share of 17.3% for 2022 and 16.3% for 2023. The third-party funding that is necessary for subsequent investment in market-ready production facilities following product development is not included.

Links:

https://www.bmwk.de/Redaktion/DE/Artikel/Technologie/technologietransfer-programm-leichtbau.html

With its "Technology transfer programme – lightweighting" (*Technologietransfer-Programm Leichtbau* (TTP LB)), the Federal Ministry for Economic Affairs and Climate Action funds application-oriented research and development projects in order to promote the widespread industrial adoption of lightweighting as a key technology and innovation driver for a sustainable economy.

Lightweighting is a holistic design philosophy that extends from the design stage to production and recycling and aims for weight optimisation, material savings and recyclability while maintaining or improving functionality. Lightweight products primarily save on materials in production and thus reduce resource use. This results in a significant reduction in energy consumption and emissions associated with the extraction and processing of resources into materials and semifinished products. New approaches additionally make it possible to substitute particularly resource-intensive materials with alternatives that have a smaller carbon footprint. Lightweighting also delivers considerable energy savings in the use phase, especially in load-moving applications, for example when lightweight parts are used in vehicles.

A further focus of the programme is on developing methods for recycling or reusing lightweight products in line with circular economy principles. This in turn reduces the use of new input materials that can be substituted with recyclates or reused components and results in further energy and emission reductions in primary resource extraction.

The programme thus gives a threefold boost to climate change mitigation. Lightweighting leads to GHG reductions not only through direct energy savings, but also to a major extent through greater resource efficiency, increased recycling and lower resource use. This, combined with the application of lightweighting in numerous different products and processes across different industries, results in the lightweighting programme playing a key role in promoting a carbon-neutral economy.

The programme consists of five programme lines that reflect the three budget items and focus among other things on technology development, carbon emission reduction and resource efficiency.

	2022		2023	
Programme line	Total funding (in € million; multi-year)	Number of projects	Total funding (in € million; multi-year)	Number of projects
1. Technology development to support German industry in lightweighting (0901 683 15)	8.3	9	20.7	17
2. Carbon emission reduction and carbon storage through the use of new construction techniques and materials (6092 686 17)	79.6	49	120.4	74
3. Carbon emission reduction through resource efficiency and substitution (6092 686 15)	94.5	63	154.4	94
4. Demonstration projects (thematically assigned to PL1-3)	17.8	13	26.4	18
5. Standardisation (thematically assigned to PL1-3)	8.4	8	12.6	11
Total	**208.6**	**142**	**334.5**	**214**

Project example for programme line 1:

Joint project: **FunPul**[44] – Inline functionalisation of pultrusion profiles; 03LB1002A-F; partners: Hörmann Vehicle Engineering GmbH, FiberCheck GmbH, LOV – Limbacher Oberflächenveredelung GmbH, Maus GmbH Modell- und Formenbau, Modespitze Plauen GmbH, FhG – Fraunhofer Institute for Machine Tools and Forming Technology (IWU)

The project's main objective is to modify and utilise the pultrusion process to enable the cost-effective manufacturing of multifunctional lightweight structures across different industries. Functionalisation is achieved on the one hand by integrating metal inserts and on the other by embedding sensor elements for component monitoring. Two demonstration components – one for rail vehicle construction and one for wind turbines – are used for the proof of technology. Over the course of the project, a technology transfer took place between the two sector-specific functionalisation strategies. The functional enhancement achieved results in a higher degree of lightweighting and potential carbon emission reductions. The project ran from 1 January 2021 to 31 December 2023.

Project example for programme line 2:

Joint project: **AGRILIGHT**[45] – Development of a lightweight framework structure made from fibre-reinforced plastics and innovative hybrid connection points for use in agricultural machinery; 03LB2019A-D; partners: M & D Composites Technology GmbH, Maschinenfabrik Bernard Krone GmbH & Co. KG, Leibniz Universität Hannover, Technische Universität Clausthal

The AGRILIGHT project aims to markedly improve the central, highly stressed frame structures of heavy agricultural harvesting machinery by significantly reducing component weight through the use of thermoset carbon composites. This conserves resources and reduces fuel consumption and carbon emissions. The joint project runs from 1 June 2021 to 31 May 2025. The project succeeded in developing the world's first

44 https://www.bmwk.de/Redaktion/DE/Dossier/Leichtbau/Archiv/Archiv-Newsletter.html (newsletter 03/2021) and https://lightweightingatlas.com/en/project#insightId=17&toggle=109

45 https://lightweightingatlas.com/en/project#insightId=44&toggle=109

agricultural machinery chassis from carbon-fibre reinforced plastic (CFRP) with an integrated tank, and on account of this, was a finalist in the prestigious JEC Innovation Award 2024 in the "Equipment, Machinery and Heavy Industries" category. JEC World is the leading trade fair for composites. The innovative CFRP chassis offers a 50% reduction in weight and between 60 and 350% higher bending and torsional stiffness compared to conventional steel chassis. This makes it easier to get a vehicle permit for one of these extremely heavy machines. In addition, the lighter-weight construction minimises soil compaction.[46]

Project example for programme line 3:

Joint project: **CC-Mesh**[47]– Symbiosis of two opposites – transfer of innovative design and reinforcement concepts (CARBCOMesh) from lightweight construction to concrete construction; 03LB3003A-D; partners: CARBOCON GmbH, HA-CO Carbon GmbH, Technische Universität Dresden, Leipzig University of Applied Sciences

The primary focus of the project is the development of market-ready components for concrete construction using innovative, large-format, load path-optimised carbon fibre reinforcement structures. The aim is to use the carbon fibre reinforcement structure to create durable concrete components that are optimised in terms of the distribution of forces along load paths, thereby saving resources. This is achieved by a symbiosis of design principles from lightweighting and conventional concrete engineering. The aim is not only to save on reinforcement by optimally arranging the components, but also to drastically reduce the amount of concrete needed, as concrete has a significant negative impact on the environment. The innovative carbon-fibre reinforcement element CARBCOMesh will enable the construction principles developed by the project partners to be implemented on an industrial scale and allow the construction method to be widely used as a resource-saving alternative to concrete construction. This can make a significant contribution to the goal of reducing carbon emissions in Germany. The project runs from 1 November 2020 to 30 April 2024.

Project example for programme line 4:

Joint project: **Aerolight**[48] – Revolutionary production process for spherical, cost-effective aerogels; 03LB4006A-B; partners: PROCERAM GmbH & Co. KG, FhG – Fraunhofer Institute for Environmental, Safety and Energy Technology (UMSICHT)

The project aims to further the development of an innovative production process for aerogels to make them economically competitive in the mass market for thermal insulation. If successful, the use of aerogels will more than halve thermal conductivity compared to conventional insulation materials such as polystyrene. This means that insulation can also be halved in thickness, enabling significant gains in usable building space. The project runs from 1 April 2021 to 31 December 2024. It achieved major successes in 2023, winning the Joseph von Fraunhofer Award[49] for the development of a mass production process for aerogels and the European Association of Research and Technology Organisation (EARTO) Innovation Award 2023 in the "Impact Expected" category (EARTO Award 2023)[50]. The non-profit EARTO confers this award for products and services with a significant social or economic impact for the EU.

46 https://lightweightingatlas.com/en/project#insightId=22&toggle=109 and https://www.ifw.uni-hannover.de/en/institute/news-und-veranstaltungen/news/news-details/news/worlds-first-agricultural-machinery-carbon-chassis-among-the-finalists-for-the-prestigious-jec-innovation-award-and-soon-to-be-on-show-at-hannover-messe-2024

47 https://www.bmwk.de/Redaktion/DE/Dossier/Leichtbau/Archiv/Archiv-Newsletter.html (newsletter 01/2021)

48 https://lightweightingatlas.com/en/project#insightId=24&toggle=109 and https://www.umsicht.fraunhofer.de/en/projects/aerogel-new-manufacturing-process.html

49 https://www.fraunhofer.de/en/about-fraunhofer/excellence-in-research/fraunhofer-research-awards/2023/joseph-von-fraunhofer-prize-2023-umsicht.html

50 https://www.umsicht.fraunhofer.de/en/press-media/press-releases/2023/earto-award-2023.html

Project example for programme line 5:

Joint project: **Enabl3D**[51]– Efficient quality assurance method for bionic and resource-saving 3D printing components; 03LB5000A-C; partners: FhG – Fraunhofer Research Institution for Additive Manufacturing Technologies IAPT, VisiConsult X-ray Systems and Solutions GmbH, Imprintec GmbH

The aim of the project is to develop a new method for efficient quality assurance in order to make 3D printed lightweight metal components for the aerospace, automotive and medical engineering more cost-effective. The method is based on an intelligent combination of indentation plastometry testing, process monitoring and µCT technology. Innovative indentation plastometry testing is used to measure the relevant material properties (tensile strength, yield strength, ductility and anisotropy) directly on the component. High-resolution process monitoring data makes it possible to verify process stability and thereby transfer locally measured properties to the entire component. In addition, critical regions can be identified and examined non-destructively using µCT scans. If successful, in addition to the potential cost reduction, the project will contribute towards halving the testing time and help monitor or reduce carbon emissions in additive manufacturing, including in lightweighting. The project ran from 1 October 2020 to 31 July 2023.

Further examples of projects can be found in the "Technology transfer programme – lightweighting" newsletter archive.

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51 https://lightweightingatlas.com/en/project#insightId=38&toggle=109

3.4.2. Research and development funding in the construction and building sector

	2022	2023
Budget chapter and item:	2501 686 81	
Eligible expenditures:	€9.6 million	€9.7 million
GHG emission reduction:	Not available	Not available
Projects:	164	144
Funding share:	Maximum 90%	Maximum 90%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) c) d) e) f)	

Assumptions and limitations: Projects have different durations of up to three years.

Links: https://www.zukunftbau.de/projekte/forschungsfoerderung

General project description:

With its "Zukunft Bau" (Future of Building) funding programme, the Federal Ministry for Housing, Urban Development and Building funds research and development projects that generate insights, strategies, concepts, processes, techniques and materials for the future-focused and sustainable development of architecture and the building and housing sector.

The programme provides a platform for designing, testing and communicating innovative approaches, as well as for exploring new framework conditions and discussing the future of building with industry stakeholders.

Funding priorities 2022:

- Time- and cost-optimised construction and refurbishment that prioritises ease of access
- Climate-neutral and climate-adapted buildings
- Building and refurbishing according to the circular economy principle, reusing and conserving resources
- Making the entire construction process and value chain fit for the future
- Added value of architecture and architectural practice: quality of life
- Design quality of built environments

Funding priorities 2023:

- Time- and cost-optimised construction, improving efficiency
- Climate-neutral and climate-adapted buildings
- Circular economy, reusing and conserving resources

The amount of the grant per project (funding rate) is based on the applicant's classification by category of enterprise in accordance with Annex I to the General Block Exemption Regulation (GBER). The maximum funding rate is 90%.

Project name (click on project name to visit website)	**Brief description**	**Eligible expenditures** (in € million)	**Duration**
2022			
Development of timber construction systems for building processes using distributed robotics Federal funding: €0.182 million (for example, the manufacture and assembly of removable, reusable, timber-only and functionally adapted wooden structures) (basic research)	The main focus of the project is on researching in-situ manufacturing and assembly processes on building sites using distributed robotics. The term "distributed robotics" describes a large number of small, agile construction robots that work in parallel processes to manufacture complex function-specific building assemblies from individual parts. The advantage of distributed robotics is that the machines are small and cost-effective. To harness the potential of these emerging robotic technologies for the construction industry, fundamental research needs to be conducted into building systems and construction methods that are specifically designed for such radically different building processes. The goal of this project is to investigate the basic features and characteristics of building systems in order to unlock the potential of distributed robotics for the construction industry. The use of distributed, autonomous small machines to manufacture architectural timber structures on building sites is a new and innovative approach in the construction industry that synergistically combines the potential of the future-proof building material wood with the potential of digital planning and manufacturing. In this way, the project contributes to conserving resources and to circular construction.	0.095	Jan. 2021 – Dec. 2022
BetaHood – mobile, sustainable and social temporary neighbourhoods Federal funding: €0.217 million (basic research)	BetaHood is focused on mobile structures as a potential way of creating socially inclusive temporary neighbourhoods. During the basic research phase, the potential of mobile housing structures and ways in which they could be used are being explored with a focus on developing neighbourhoods that are environmentally and economically sustainable and user-centred. The project aims to develop guidelines for mobile neighbourhoods. The research is important for advancing the overarching BetaHood model project, which aims to implement an initial neighbourhood in the form of a pilot project. The project's	0.039	Apr. 2021 – Mar. 2022

Project name (click on project name to visit website)	**Brief description**	**Eligible expenditures** (in € million)	**Duration**
	holistic approach and research supports the transformation of the German construction sector by addressing climate change and promoting social and intergenerational fairness. The fact that the neighbourhoods can be moved creates new models for temporary use, thereby expanding the potential for the redensification of urban spaces.		
Einfach Bauen 3 – Messen, Validieren, Rückkoppeln (Simple Construction 3 – Measuring, Validating, Feedback) Federal funding: €0.269 million (basic research)	Einfach Bauen 3 is the final part of the Einfach Bauen series. The principles of simple construction that were researched in Einfach Bauen 1 are currently being implemented in the planning and construction of three research houses in Bad Aibling (Einfach Bauen 2). In Einfach Bauen 3, the aim is to conduct long-term measurements during the usage phase (winter and summer) to provide comparative information about the building envelope, thermal comfort and energy consumption. Measuring, validating and feedback will be used to evaluate the qualities of the three buildings in order to understand the potential of the Einfach Bauen project in concrete terms. The research projects Einfach Bauen 1 to 3 have made an important contribution to climate-friendly and resource-efficient construction. Overall, the research projects have demonstrated that the construction, operation and maintenance of simple, robust buildings can be more sustainable in the long term than complex building structures and building technology. The funded projects made a decisive contribution to the general discussion about simple construction.	0.121	Nov. 2020 – Jan. 2023
2023			
Tera X – braided wood: technical radial braiding of solid wood structures Federal funding: €0.285 million (basic research)	Wood fibres made from willow are to be interwoven on a fully automated radial braider to create high-performance, high-strength semi-finished products for building components with high degrees of deformation and design quality. The project is developing new construction and design-relevant structures for the building sector with a new design language that combines light, pleasant wooden surfaces with a range of braiding techniques and designs. The automated	0.094	Jul. 2021 – Jul. 2023

Project name (click on project name to visit website)	**Brief description**	**Eligible expenditures** (in € million)	**Duration**
	processing of wood fibres on a radial braiding machine is pushing the boundaries of textile technology and generating significant demand for basic research in this area. This includes developing (a) methods to evaluate the suitability of wood fibres for processing, (b) mechanical engineering modifications to the braiding system, (c) bonding processes and structural designs, and (d) testing procedures for process and quality monitoring. The project contributes to conserving resources and to circular construction. The use of this native wood species, in combination with Germany's highly advanced radial braiding technology and expertise in the complex planning of braided structures and curved components, supports regional circular economies along the entire value chain. This extends from agriculture, the timber industry and the bioeconomy to manufacturers of braided semi-finished products and composite manufacturers, through to architects and construction-site workers.		
Development of practice-oriented methods for the 3D printing of the composite material reinforced concrete Federal funding: €0.358 million (basic research)	Additive manufacturing of concrete using extrusion-based printing methods has groundbreaking potential and is likely to fundamentally change the way we build. However, existing additive manufacturing solutions for unreinforced concrete components are not sufficient to reliably withstand the loads encountered in real structures. In future, new production processes will be needed to integrate steel reinforcement into the concrete printing process. Completely new additive manufacturing methods for reinforced concrete are being developed and researched to meet practical requirements. As well as developing new 3D printing processes for reinforced concrete, the project is also characterising the mechanical properties of the printed concrete (e.g. the interface layers of the concrete layers), the reinforcing steel and the printed composite material. The participating institutes have done preliminary work on concrete 3D printing (IMB) as well as steel 3D printing and reinforcing steel welding (ISF). Combining both processes is highly complex and has not yet been	0.091	Jan. 2022 – Jan. 2024

Project name (click on project name to visit website)	Brief description	Eligible expenditures (in € million)	Duration
	researched. The research project can support the development of (material-)efficient construction methods, thereby creating economic benefits, such as shorter construction times and reduced construction and life-cycle costs, opening up new design possibilities and helping to conserve environmental resources.		

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4. Energy and industry

In order to achieve its climate targets, Germany is fully committed to the energy transition. The energy and industry sector covers measures designed to accelerate the transition to an economy based largely on renewable energies and to an eco-efficient use of energy and resources. The energy and manufacturing industries are responsible for most of Germany's greenhouse gas emissions[52]:

- The industrial sector was responsible for around 24% of total emissions in 2024. This corresponds to 153 million tonnes of CO_2 equivalents. Compared to the previous year, greenhouse gas emissions from industry remained virtually unchanged, increasing by just 0.1%. An increase in emissions in the iron and steel industry and the chemical industry was offset by declining emissions in the cement industry.
- The energy industry is responsible for the largest share of emissions, at 29%. In 2024, its greenhouse gas emissions totalled 185 million tonnes of CO_2 equivalents. Compared to the previous year, the sector's emissions fell by about 18 million tonnes of CO_2 equivalents, or 8.7%. This was mainly due to the sharp increase in renewable energies in gross electricity consumption.
- The building sector was responsible for around 16% of total direct emissions in Germany in 2024. Emissions from the sector fell by approximately 2.3% between 2023 and 2024 to 101 million tonnes of CO_2 equivalents. The slight fall in emissions is mainly due to the mild weather in this period.

Renewable energy sources are being continuously and reliably expanded. Energy efficiency is being improved in the energy industry itself as well as in the buildings sector and energy-intensive industries. Nuclear and coal-fired power generation is being gradually phased out in Germany.

The main funding instrument in this area is the Climate and Transformation Fund (*Klima- und Transformationsfonds*, KTF). The programmes funded by the Climate and Transformation Fund play a central role in implementing the energy transition and in achieving national and international climate action targets.[53] The sector's eligible expenditures in 2022 totalled €2,743.5 million and were distributed across 10 budget items. The sector's eligible expenditures in 2023 totalled €2,524.1 million and were distributed across 11 budget items. For both years, the budget items can be assigned to the following subsectors:

[52] See pp. 20 and 21 of the Climate Action Report 2025 the predicted greenhouse gas emissions balance published by the Federal Environment Agency, see https://www.umweltbundesamt.de/en/press/pressinformation/germany-on-track-for-2030-climate-targets

[53] In addition, the KfW offers a broad range of funding programmes for energy-efficient building refurbishment. These are taken into account for KfW green bonds. Measures earmarked in Germany's Recovery and Resilience Plan (DARP) for the European Commission's Next Generation EU recovery instrument were not taken into account as eligible expenditures for Green German Federal securities.

	2022		2023	
Subsector	Eligible expenditures (in € million)	Number of budget items	Eligible expenditures (in € million)	Number of budget items
Energy research	564.5	2	557.1	3
Renewable energy	1,396.6	3	816.8	3
Energy efficiency	563.6	4	851.7	4
National climate action measures	218.8	1	298.5	1

4.1. Energy research

4.1.1. Energy research

	2022	2023
Budget chapter and item:	0903 683 01	
Eligible expenditures:	€521.1 million	€501.9 million
GHG emission reduction:	Not available	Not available
Projects:	4,839	4,836
Funding share:	69.19%	71.19%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: The projects running in 2022 and 2023 had an average funding rate of 69.19% and 71.19% respectively. This means that 69.19% (2022) and 71.19% (2023) of the total of all project costs was met by the federal government and the remainder by the companies.

Links: 2023 Federal Government Report on Energy Research:
https://www.bundeswirtschaftsministerium.de/Redaktion/EN/Downloads/F/federal-government-report-on-energy-research-2023.html
2024 Federal Government Report on Energy Research:
https://www.bundeswirtschaftsministerium.de/Redaktion/EN/Publikationen/Energie/2024-federal-government-report-on-energy-research.html
https://www.energieforschung.de/en/home
LOReley: https://www.energieforschung.de/en/home/project-insights/2024/lohc-releasing-hydrogen-more-dynamically-with-a-plate-reactor
NRM H_2: https://www.energieforschung.de/de/aktuelles/news/2024/normungsroadmap-wasserstofftechnologien-veroeffentlicht

The 2023 Federal Government Report on Energy Research provides a transparent overview of the goals and measures of energy research for the 2022 reporting period. Note: The Federal Government Report on Energy Research also contains projects whose expenditures are not eligible for Green German Federal securities. Project profiles for ten examples of eligible expenditures can be found in the Federal Government Report on Energy Research 2023:

Report page	Project name (further details in the body of the report)	Funding (in € million; multi-year)
34	INNOMET – Development of innovative printing technologies for the fine-line metallisation of silicon solar cells	1.0
36	HiL-GridCoP – Hardware-in-the-loop testing of the electrical grid compatibility of multi-megawatt wind turbines with high-speed generator systems	8.7
42	WärmeGut – Nationwide standardised geothermal information on near-surface geothermal energy in Germany	13.8
42	Warm-Up - Developing criteria for selecting exploration measures and locations for medium-depth geothermal energy	2.8
45	4FH2Max – Optimising the existing combustion system of the Siemens Energy 4000F gas turbine for safe operation with a hydrogen content >50% vol. to reduce CO_2 emissions.	2.6
47	RegEnZell – Cross-cell regionalisation of energy supply through operationally optimised sector coupling	2.2
50	HyReK – HybridRegelKraftwerk 2.0 – Development, optimisation and validation of a sector-coupling hybrid storage system for providing primary balancing power	2.5
53	OffsH_2ore – Offshore hydrogen production using offshore wind energy as an isolated solution	2
57	METIS – Development of new interdisciplinary methodological and analytical processes to incorporate the complexity of the energy transition in energy system models	1.8
61	KreislaufAkkus – Efficiency and recycling potential of battery systems in electric mobility	0.5
66	Akzept – Effects of self-sufficient energy supply and membership in citizen energy companies on social inequality and their contribution to social acceptance of the energy transition	0.19

The 2024 Federal Government Report on Energy Research provides a transparent overview of the goals and measures of energy research for the 2023 reporting period. Note: The Federal Government Report on Energy Research also contains projects whose expenditures are not eligible for Green German Federal securities. Project profiles for five examples of eligible expenditures can be found in the 2024 Federal Government Report on Energy Research. Two further examples can be found on energieforschung.de.

Information on project funding under the Federal Ministry for Economic Affairs and Climate Action's Energy Research Programme can be found at energieforschung.de. This includes information on the 8th Energy Research Programme for Applied Energy Research, with which the ministry supports research missions, as well as articles on the research results of funded projects.

Report page	Project name (further details in the body of the report)	Funding (in € million; multi-year)
25	ML4Heat – Tools to optimise the operation of district heating networks based on machine learning methods	1.0
40	flexQgrid – Practical implementation of the quota-based grid traffic-light system to enable optimal use of flexibilities within and from the distribution grid	5.2
44	EH_2C – Hydrogen recycling through electrochemical compression	1.3
46	EMUSE – Energy cooperatives as multipliers for energy sufficiency	0.47
52	CO_2-Preis – Analysis of the short- and long-term effects of different CO_2 pricing options on society and the economy	1.5
	LOReley – High-performance H_2 release in LOHC reactors using efficient surface catalysts	2.2
	NRM_H_2 – Standardisation roadmap for hydrogen technologies	9.2

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4.1.2. Living labs for the energy transition

	2022	2023
Budget chapter and item:	0903 686 08	
Eligible expenditures:	€43.4 million	€39.7 million
GHG emission reduction:	Not available	Not available
Projects:	190	221
Funding share:	59.30%	49.53%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: The projects running in 2022 and 2023 had an average funding rate of 59.30% and 49.53% respectively. This means that 59.30% (2022) and 49.53% (2023) of the total of all project costs was met by the federal government and the remainder by the companies.

Links: 2023 Federal Government Report on Energy Research:
https://www.bundeswirtschaftsministerium.de/Redaktion/EN/Downloads/F/federal-government-report-on-energy-research-2023.html
https://www.energieforschung.de/en/home

The 2023 Federal Government Report on Energy Research provides a transparent overview of the goals and measures of energy research for the 2022 reporting period. Note: The Federal Government Report on Energy Research also contains projects whose expenditures are not eligible for Green German Federal securities. Project profiles for one example of eligible expenditures can be found in the 2023 Federal Government Report on Energy Research. Four further examples can be found on energieforschung.de.

Information on project funding under the Federal Ministry for Economic Affairs and Climate Action's Energy Research Programme can be found at energieforschung.de. This includes information on the 8th Energy Research Programme for Applied Energy Research, with which the ministry supports research missions, as well as articles on the research results of funded projects.

Project examples (click on the project name to visit the website)	**Total funding** **(in € million; multi-year)**
2022	
Trans4ReaL – Transfer research for the "living labs of the energy transition" to accelerate the development of sector coupling and hydrogen technologies (p. 19 of the report)	7.0
Energiepark Bad Lauchstädt – Demonstration of sector coupling: wind electrolysis for the production, storage and transport of green hydrogen	37.5
2023	
RefLau – Reference power plant in the Lausitz region	28.4
H_2-Wyhlen – Development and construction of a test facility for renewable, electricity-based hydrogen production involving the building, transport and industrial sectors	14.5
NRL – North German living lab	52.0

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4.1.3. Implementation of the Hydrogen Strategy

	2022	2023
Budget chapter and item:		6092 892 03
Eligible expenditures:		€15.5 million
GHG emission reduction:		Not available
Projects:		136
Funding share:		64.95%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: The projects running in 2023 had an average funding rate of 64.95%, meaning that 64.95% of the total of all project costs was met by the federal government and the remainder by the companies.

Links:
https://www.energieforschung.de/en/home

Information on project funding under the Federal Ministry for Economic Affairs and Climate Action's Energy Research Programme can be found at energieforschung.de. The website includes information on the 8th Energy Research Programme for Applied Energy Research, with which the ministry supports research missions, as well as articles on the research results of funded projects.

Project name (click on the project name to visit the website)	**Total funding (in € million; multi-year)**
HydroNet – Climate protection model project in the Sauerland region	17.9
EnEff:Stadt: enerPort II – Optimised energy use in the port microgrid @ DGT	11.6
BioH$_2$Ref – Decentralised hydrogen production from biogas using steam reforming	1.3

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4.2. Renewable energy

4.2.1. Foreign Trade Strategy for Hydrogen – International Cooperation on Hydrogen

	2022	2023
Budget chapter and item:	0904 896 02	
Eligible expenditures:	€45.4 million	€446.2 million
GHG emission reduction:	Not available	Not available
Cooperation projects:	3	7
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: --

Links:
https://www.bundeswirtschaftsministerium.de/Redaktion/EN/Publikationen/Energie/importstrategy-hydrogen.pdf?__blob=publicationFile&v=7
https://www.bundeswirtschaftsministerium.de/Redaktion/EN/Hydrogen/Dossiers/national-hydrogen-strategy.html

Under this budget item, funding is provided for measures that support the global market ramp-up of the hydrogen sector. This includes necessary pilot projects with new technical systems or facilities, feasibility studies and investment subsidies for German companies. The funding is also intended to bring about a rapid increase in the availability of green hydrogen in Germany.

The purpose of the "H_2Uppp" funding instrument is to co-finance feasibility studies at the start of a project phase. During the implementation phase, the initial plan is to carry out pilot projects involving new technical systems. To this end, subsidies are provided for German companies under the funding guideline for international hydrogen projects (*Förderrichtlinie für Internationale Wasserstoffprojekte*).

The Green Hydrogen Fund of the European Investment Bank provides investment grants and consulting services for large-scale projects along the entire value chain relating to green hydrogen and derivatives in countries outside of the EU/EFTA. The aim is to accelerate the global market ramp-up and infrastructure development. Implementation details and the scope of funding are in the planning stage. Further information is available at https://www.eib.org/en/products/mandates-partnerships/donor-partnerships/trust-funds/green-hydrogen-fund

Pilot projects cannot be upscaled to a commercially viable size without purchase agreements. H_2Global is currently the only instrument worldwide to enter into such purchase agreements and to resell the hydrogen in Germany and across Europe.

Three public-private partnership projects were launched in emerging and developing countries in 2022, and seven in 2023, through the H_2Uppp programme. In cooperation with the German technology provider Enapter (AEM electrolysers) and the Energy Research and Development Institute-Nakornping (ERDI) at Chiang Mai University, the Federal Ministry for Economic Affairs and Climate Action developed the "Chiang Mai Knowledge Hub for Green Hydrogen" through H_2Uppp. The hub consists of a training centre including a test facility at the ERDI Institute and a demonstration system at Enapter's Phi Suea

House. The first public training session took place in March 2024 with approximately 60 representatives from German and Thai energy sector companies.

A large number of projects are being funded through the funding guideline for international hydrogen projects. One example is the Oshivela project in Namibia. As the first production facility in Africa to use climate-neutral technology to produce iron on an industrial scale, the goal of the project is to help this technology gain market traction and to enable a green iron and steel industry that is not reliant on coal or natural gas. HyIron technology from CO2GRAB GmbH and TS Elino GmbH is central to the project. The construction of the industrial-scale site has now also been completed within the project's planned implementation period. Most recently, a 12-megawatt electrolyser, which produces hydrogen using solar power, was installed along with an airtight rotary kiln for the emission-free ironworks.

The measures and funding referred to support the global ramp-up of the market for green hydrogen. Further information on the hydrogen strategy can be found in the National Hydrogen Strategy and its update.

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4.2.2. Improving framework conditions for shore-to-ship power supply in German ports

	2022	2023
Budget chapter and item:	6092 882 01	
Eligible expenditures:	€12.4 million	€31.5 million
GHG emission reduction:	2,920 t CO_2e p.a.	9,960 t CO_2e p.a.
Shore power systems under construction:	30	19
Completed shore power systems:	3	11
Funding share:	50%	50%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	e)

Assumptions and limitations: Since 2022, up to 50% of the eligible costs funded by the *Länder* can be co-funded by the federal government.

Links: --

The eligible expenditures support investments in port infrastructure to improve shore power supply to seagoing and inland waterway vessels while in port. The aim is to substitute fossil fuel-based on-board power generation with renewable energy and thus reduce greenhouse gas emissions, particulate matter and noise. Specifically, this avoids emissions of carbon dioxide (CO_2), nitrogen oxides (NO_x), sulphur oxides (SO_x) and particulate matter (PM). Noise is also reduced. Specific quantitative expansion targets are set out in programmes to be submitted annually by the *Länder*.

The *Länder* participating in the federal financial assistance programme for shore power are Bavaria, Baden-Württemberg, Bremen, Hamburg, Rhineland-Palatinate, North Rhine-Westphalia, Lower Saxony, Saxony-Anhalt, Schleswig-Holstein, Mecklenburg-Western Pomerania and Hesse. Under an administrative agreement, the federal government co-finances 50% of the eligible costs for expanding the provision of shore power. Shore power systems for seagoing vessels are large-scale construction projects that are implemented over several years.

In 2022, three shore power systems were completed with the help of the federal financial assistance programme for shore power. These shore power systems are expected to reduce GHG emissions by 2,920 tonnes of CO_2e per year. The systems constructed in 2022 have the potential to save around 32,768 tonnes of CO_2e per year.

A further 11 shore power systems were added in 2023 and are expected to reduce CO_2e emissions by 9,960 tonnes. The systems constructed in 2023 have the potential to save around 32,768 tonnes of CO_2e per year. However, the annual CO_2 savings potential will decrease in future to the extent that CO_2 emissions from shipping fleets are reduced.

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4.2.3. Funding to promote energy efficiency and renewable energy measures in the buildings sector

	2022	2023
Budget chapter and item:	6092 893 10	
Eligible expenditures:	€1,338.8 million	€339.1 million
GHG emission reduction:	14.6 million t CO_2e	3.7 million t CO_2e
Funded projects:	86,700	15,500
Funding share:	See below	See below
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: The GHG reduction figure relates to the lifetime of the systems for which funding was paid out in 2022 and 2023. The timing of the actual implementation may vary from this. For a detailed description of the assumptions/methodology, please refer to the evaluation report. Please refer to the evaluations of the CO_2 Building Rehabilitation Programme and the Market Incentive Programme (MAP). The GHG reduction is determined by extrapolating from the funding efficiency of the MAP in 2021.

Links: https://www.energiewechsel.de/KAENEF/Redaktion/DE/PDF-Anlagen/evaluation-marktanreizprogramms-map-2021.pdf?__blob=publicationFile&v=2

A wide range of measures are needed to achieve a near-climate-neutral building stock. The Market Incentive Programme (MAP) contributes to this by providing investment incentives that are intended to support the market penetration of renewable heating technologies and increase their share. For this reason, funding was provided for solar collector systems, solid biomass combustion systems, efficient heat pumps, deep geothermal systems and particularly innovative technologies for heating and cooling. The MAP was replaced in 2021 by the Federal Funding Programme for Efficient Buildings (*Bundesförderung für effiziente Gebäude* (BEG)) and is currently being wound up.

Funding under the MAP was provided in the form of investment cost subsidies processed by the Federal Office for Economic Affairs and Export Control (BAFA) – primarily for smaller renewable heating systems in detached and semi-detached houses – and subsidies under the KfW "Renewable Energies – Premium" programme for the accelerated partial repayment of low-interest KfW loans for higher-output renewable energy systems. The Heating Optimisation Programme (HZO) ended at the end of 2020. The original objective of the funding guidelines of 13 July 2016 on heating optimisation through high-efficiency pumps and hydraulic balancing was to support the installation of heat pumps and to further optimise heating systems to make them run more efficiently.

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4.3. Energy efficiency

4.3.1. Funding of urban energy redevelopment measures (addendum to project title from 2023 onwards: – climate action and climate adaptation at the district level)

	2022	2023
Budget chapter and item:	6092 661 01	
Eligible expenditures:	€16.4 million	€12.2 million
GHG emission reduction:	Not available	Not available
New project commitments to local authorities:	368	327
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: --

Links:

2022:

https://www.bbsr.bund.de/BBSR/DE/veroeffentlichungen/bbsr-online/2023/bbsr-online-08-2023-dl.pdf

2023:

https://www.bbsr.bund.de/BBSR/DE/forschung/programme/weitere/ktf/evaluierung-foerderprogramm-energetische-stadtsanierung/01-start.html?pos=2

https://energetische-stadtsanierung.info/infothek/berichte-und-dokumentationen/

https://www.kfw.de/stories/umwelt/energieeffizienz/witt_stadtsanierung/

To achieve the German government's climate action targets, substantial efforts are needed to enhance energy efficiency and improve climate action at the local authority and district levels. The subsidy portion of the KfW-administered "Energy-efficient urban redevelopment" (*Energetische Stadtsanierung*) funding programme (KfW 432) is taken into account for Green German Federal securities. Thus, since 15 November 2011, local authorities have received support in developing district-specific approaches for climate action and evaluating different options. Subsidies are granted for the development of integrated district plans and redevelopment management structures to support and coordinate the planning and implementation of the measures set out in the district plans. When developing and implementing individual measures, aspects relating to historic monument preservation, architectural heritage and nature conservation are taken into account, along with housing-related, demographic and social issues.

Integrated district plans outline the technical and economic energy saving potential, options for the use of renewable energy in the district supply as well as ways of adapting to climate change at the district level. They identify measures that have the potential of reducing carbon emissions in the short, medium and long term. District plans offer an important basis for decision-making and planning at the district level with regard to investments that are geared towards enhancing the overall efficiency of energy-related measures. The plans can address aspects of district redevelopment to meet the needs of elderly people, ways of improving the accessibility of existing buildings and of local infrastructure, new proposals for the use of existing buildings, proposals for mixed districts featuring new and existing buildings, issues relating to the

district's social structure and the effects of redevelopment measures on residents.

Issues involved in creating a sustainable, climate-friendly transport system and green infrastructure in the district as well as the use of digital technologies are also important and can form part of integrated district plans.

Practical example – Frankfurt:

The city of Frankfurt received subsidies under KfW 432 totalling €572,876.71 for two integrated energy-related district plans and redevelopment management plans for the districts of Sossenheim-West and Sossenheim-Ost. The city aims to achieve a 95% reduction in greenhouse gas emissions by 2035 and halve its energy consumption by 2050. Because urban energy redevelopment is key to achieving these aims, integrated energy-related district plans were created for Sossenheim-Ost and Sossenheim-West, each containing solutions and proposals for reduction/saving potential and measures, especially relating to the reorganisation of the heat supply and of energy-efficient building refurbishments. Alongside general aspects of climate action, priorities include reviewing a new heat supply structure for certain sub-areas of the system. For example, key issues include the use of waste heat from nearby data processing centres as well as the potential use of river heat. In the context of building refurbishment, areas of focus include serial refurbishment and listed building requirements. As for climate-related aspects, the plans also separately look at the subjects of open spaces and mobility. Integrated energy-related district plans bring in all relevant stakeholders from the outset with a view to producing implementation-oriented plans that are geared perfectly towards the subsequent redevelopment management structures.

Practical example – Göttingen:

The city of Göttingen received subsidies under KfW 432 totalling €56,250 for the development of an integrated energy-related district plan for the district of Mittelberg. The objectives of the funding are to save energy, reduce carbon emissions, enhance energy efficiency, increase the refurbishment quota and support the expansion of renewable energy. An integrated approach was taken, with a focus not only on energy, but also on climate adaptation, mobility, accessibility of public spaces and infill development, all of which were analysed in depth.

The integrated energy-related district plan for Mittelberg included identified suitable types of heat supply for the district and specified what refurbishment measures are recommended for different types of buildings, among other outcomes.

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4.3.2. Energy efficiency in industry and busineses

	2022	2023
Budget chapter and item:	6092 686 08	
Eligible expenditures:	€278.7 million	€449.4 million
GHG emission reduction:	0.79 million t CO_2e p.a.	1.07 million t CO_2e p.a.
End-use energy savings:	2,142,000 MWh p.a.	2,817,000 MWh p.a.
Funding share:	100%	100%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: The estimate is based on the evaluation report on the funding programme. However, the savings identified in the evaluation report relate to the approved funding volume, which differs from the eligible expenditures that apply here. The savings are therefore converted on the basis of the funding efficiencies identified in the evaluation report for GHG savings (2022: €44/t of CO_2; 2023: €52/t of CO_2) and end-use energy savings (2022: €16/MWh; 2023: €20/MWh) for the applicable eligible expenditures of €278.7 million in 2022 and €449.4 million in 2023. The stated annual CHG savings and end-use energy savings apply as of 2022 or 2023 for an eight-year project lifetime. The savings are in addition to the savings reported in the previous Impact Reports.

Links:
https://www.bmwk.de/Redaktion/DE/Evaluationen/Foerdermassnahmen/241217-evaluation-eew-jahresbericht-2023.pdf?__blob=publicationFile&v=6

In order to achieve the goals of the energy transition and bring about a comprehensive and far-reaching transformation of energy supply and consumption in Germany, the federal government supports investments in GHG avoidance measures and measures to reduce energy requirements in industry and businesses through the programmes "Energy and Resource Efficiency in the Economy – Grant and Loan" (*Energie- und Ressourceneffizienz in der Wirtschaft – Zuschuss und Kredit*) and "Energy and Resource Efficiency in the Economy – Funding Competition" (*Energie- und Ressourceneffizienz in der Wirtschaft – Förderwettbewerb*).

Key aims are to improve energy and resource efficiency and increase the share of renewable energy sources in the provision of process heat in companies.

Energy and Resource Efficiency in the Economy – Grant and Loan

The investment programme "Energy and Resource Efficiency in the Economy – Grant and Loan" aims to support the investments required to achieve climate and energy efficiency targets in a cost-efficient and more effective manner.

One or more investments for the replacement or acquisition of highly efficient technical systems or units for industrial and commercial are eligible for funding. They include:

- Electric motors and drives
- Pumps for industrial and commercial use
- Fans
- Compressed air systems
- Systems for waste heat utilisation or heat recovery
- Insulation of industrial plants or plant components

Funding is also available for measures to provide process heat from solar collector systems, biomass installations and heat pumps. Funding continues to be available for the acquisition and installation of measurement, control and sensor technology for the efficient control and monitoring of

energy flows for integration into an energy or environmental management system.

In addition to these individual measures, support is also to be provided for investments in measures that are more complex and have a greater focus on systemic energy and resource-related optimisation of production processes.

Energy and Resource Efficiency in the Economy – Funding Competition

The funding competition is a funding programme that is essentially open to all participants, sectors and technologies. Investments directed at GHG emission avoidance are supported through a competitive process with no specific requirements regarding the type of technology used.

The key criterion for the funding decision is the GHG reduction achieved per funding euro per year ("funding efficiency"). For this purpose, all project applications admitted to a competition round are ranked according to their funding efficiency, with approval granted based on the available funds per round. If two applications have the same funding efficiency, preference is given to the project with the higher absolute GHG reduction.

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4.3.3. Providing advice on energy efficiency

	2022	2023
Budget chapter and item:	6092 686 14	
Eligible expenditures:	€166.3 million	€232.3 million
GHG emission reduction:	0.7 million t CO_2e p.a.	0.66 million t CO_2e p.a.
Beneficiaries:	421,639	394,449
End-use energy savings:	2,475,225 MWh p.a.	2,356,465 MWh p.a.
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: Evaluation of the energy saving advice and energy checks provided by consumer advice centres; evaluation of the energy advice for residential buildings; evaluations of the "energy advice for small and medium-sized enterprises" and "energy advice for non-residential buildings of local authorities and non-profit organisations" (guidelines preceding the "Energy Advice for Non-Residential Buildings, Plants and Systems" (EBN) funding guidelines).

Links:
https://www.bafa.de/SharedDocs/Downloads/DE/Bundesamt/evaluation_energiesparberatung_energiechecks.html
https://www.bafa.de/DE/Energie/Energieberatung/Energieberatung_Wohngebaeude/energieberatung_wohngebaeude_node.html
https://www.bafa.de/DE/Energie/Energieberatung/Nichtwohngebaeude_Anlagen_Systeme/nichtwohngebaeude_anlagen_systeme_node.html

The federal government provides funding for advisory and consulting services on energy consumption and corresponding energy saving measures for all end users, including private households, SMEs, public authorities, local authorities and non-profit organisations. End users receive advice and information on energy efficiency, how to reduce energy consumption and on energy-efficient building refurbishments. They can also find out about financial incentives for improving energy efficiency and switching from fossil fuels to green energy. These services help various target groups make future-oriented decisions regarding refurbishment and energy-efficiency measures.

1. Federal funding for independent energy advice for private consumers at consumer advice centres

Consumer advice centres are the largest providers of unbiased energy advisory services in Germany. They have been advising private households since 1978, with around 1,061 energy advisors at some 978 locations throughout the country. In 2022, around 245,000 households received impartial advice on how to make their homes more energy efficient, including tips on saving electricity, improving thermal insulation, installing modern heating technology and using renewable energy. In 2023, around 230,000 household received advice. The funding provided for the advisory services means that all forms of receiving advice (in person, over the phone, online, via webinars) are free of charge.

2. Federal funding for energy and electricity savings checkups for private households – Energy Checkups

In addition to providing advice at consumer advice centres, energy advisors also visit consumers' homes in order to better address specific situations on site (relating to the building, system technology, including the use

of renewable energy, appliances, lighting) and the needs of the consumers. Around 36,000, on-site "energy checkups" were carried out in households in 2022 and around 24,000 in 2023.

3. Federal funding of independent and impartial advice for private consumers on substituting fossil fuels

The focus of this new project (as of 2023) is on providing impartial advice on replacing old, fossil-fuel heating systems (heating substitution consultation) and checking buildings' suitability for installing a photovoltaic system (PV suitability consultation). The aim is to motivate consumers to make greater use of renewable energies and enable them to make informed decisions. These forms of consultation are supplemented by a free, nationwide service hotline. People seeking initial advice can call the hotline for initial guidance or if they have specific questions. Around 16,000 consultations were provided in 2023.

4. Federal funding for energy advice for residential buildings (on-site advice, individual refurbishment roadmap)

Funding is aimed at owners of residential buildings (private house or flat owners, housing associations and homeowners' associations). A qualified energy consultant examines the entire property and prepares a comprehensive energy advice report (including an individual refurbishment roadmap). In addition to energy-saving potential, the report also identifies where renewable energy could be used and the necessary investments required, and indicates potential heating-cost and CO_2 savings. Energy advice thus helps residential property owners to include energy efficiency and renewable energy sources in their planning and decision-making processes and to take advantage of energy-saving potential at the most opportune time for them. Building owners are better informed about the added value of energy modernisation measures and are given a sound basis for decision-making. Funding is provided through the funding guidelines for energy advice for residential buildings (*Richtlinie über die Förderung der Energieberatung für Wohngebäude*). The improved funding conditions under the Climate Action Programme 2030 and a bonus available since 1 January 2021 for implementing an investment measure based on an individual refurbishment roadmap have resulted in a significant increase in demand. Applications increased from around 25,000 in 2020 to 74,000 in 2021 and 134,000 in 2022. In 2023, the number of applications remained very high, at 120,000.

5. Federal funding for energy advice for non-residential buildings, plants and systems

The funding guidelines for the programme "Energy advice for non-residential buildings, plants and systems" (*Energieberatung für Nichtwohngebäude, Anlagen und Systeme*) have been in effect since 1 January 2021. The aim is to identify potential savings and to help a variety of stakeholders (including local authorities, SMEs, companies and non-profit organisations) make decisions regarding energy-efficient building refurbishments and energy-efficient construction projects. Funding is provided among other things for energy advice on refurbishment strategies or roadmaps for non-residential buildings and on the construction of energy-efficient non-residential buildings. Funding is also provided for energy audits, which involve systematically inspecting and analysing the energy use and consumption of industrial plants, buildings, systems or organisations in order to identify ways to improve energy efficiency. Energy advice to assess suitability for an energy savings performance contract (contract information consulting) is also funded. Around 6,500 consultations were provided in 2022 and around 6,000 in 2023.

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4.3.4. Industrial production for mobile and stationary energy storage units

	2022	2023
Budget chapter and item:	6092 893 04	
Eligible expenditures:	€102.2 million	€157.8 million
GHG emission reduction:	Not available	Not available
Beneficiaries:	78	145
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	d) e)

Assumptions and limitations: Co-financing of eligible costs in part in accordance with IPCEI rules; projects can also be co-financed by the *Länder*. The stated expenditures relate only to the federal share.

Links:
https://www.ipcei-batteries.eu/

Funding of battery cell production supports the development of innovative and sustainable processes for the industrial production of batteries for electric vehicles and other applications, together with the development of re-use and recycling systems. The funding projects, which are embedded in two Important Projects of Common European Interest (IPCEI) and an R&D measure, will enable battery cells with a reduced carbon footprint to be produced in Germany and pave the way for large-scale recycling of battery raw materials. Individual projects at different stages of the battery value chain aim to improve the carbon footprint of batteries in the respective segments that are addressed. Alongside the two IPCEIs in the field of battery cell production, the innovation base along the battery value chain is being strengthened.

A key funding objective in each individual project is to improve environmental performance (such as a GHG reduction as well as energy efficiency in battery production, resource input, etc.), which is tracked in project monitoring. This research has not yet been completed at the time of publication of the Impact Report.

Example projects:

- The goal of the **Skeleton Technologies GmbH** project is to launch a fully automated and highly efficient supercapacitor cell and module production line. Areas of application include hybrid energy storage systems with high load requirements, for example in electromobility, and stationary storage systems to support grid stability.
- The **Battery Passport** project piloted a digital product passport for batteries that meets the new requirements of the EU Battery Regulation that will become mandatory in 2027. The battery passport enables the entire life cycle of a battery to be documented – from raw material extraction to production and use to recycling.

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4.4. National climate action measures

4.4.1. National Climate Initiative and national climate action measures

	2022	2023
Budget chapter and item:	6092 686 05	
Eligible expenditures:	€218.8 million	€298.5 million
GHG emission reduction:	5.71 million t CO_2e	6.92 million t CO_2e
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations: The GHG emission reductions for 2022 and 2023 are estimated based on the eligible expenditures in the individual programmes of the National Climate Initiative and the funding efficiency net figures from the 2020/2021 evaluation report.

Links:
Evaluation report 2020 and 2021: https://www.klimaschutz.de/de/ueber-die-initiative

The National Climate Initiative was launched in 2008 to actively promote climate action in all relevant target groups across society, including business and industry, public authorities and the education sector, and among end consumers. To this end, it funds both information-based and investment-based greenhouse gas reduction projects. The funding covers a wide range of climate change mitigation activities, from the development of long-term strategies to specific support and financing measures in the energy sector, transport and business/industry that contribute to the reduction of greenhouse gas emissions. In particular, it enables individuals in civil society, as well as local authorities, the education sector and the scientific community, to develop and actively implement innovative approaches to climate action.

The eligible expenditures were distributed across ten funding guidelines in 2022 and 2023. The five biggest programmes (corresponding to 88.1% of the eligible expenditures in 2022 and 89.3% of the eligible expenditures in 2023) are listed below:

	2022		2023	
Funding programme	Eligible expenditures (in € million)	Impact	Eligible expenditures (in € million)	Impact
Guidelines for the funding of climate change mitigation projects in local authorities (local authority guidelines)	93.2	approx. 5.01 million t CO_2e over the entire impact period (Ø 10.7 years)	150.7	approx. 6.21 million t CO_2e over the entire impact period (Ø 10.9 years)
Guidelines for the funding of measures on cooling and air conditioning systems in business enterprises	26.4	approx. 0.28 million t CO_2e over the entire impact period (Ø 15 years)	26.0	approx. 0.28 million t CO_2e over the entire impact period (Ø 15 years)
Funding of innovative individual climate action projects in the industry, local-authority, consumer and education sectors	28.3	only the "in Ihrer Nähe" electricity savings check-up (€9.1 million): approx. 0.035 million t CO_2e over the entire impact period (Ø 4.8 years)	31.2	Not available
"Climate Protection through Cycling" funding call	21.8	approx. 0.14 million t CO_2e over the entire impact period (Ø 25 years)	33.0	approx. 0.21 million t CO_2e over the entire impact period (Ø 25 years)
"Local authority climate protection model projects" funding call	23.2	approx. 0.19 million t CO_2e over the entire impact period (Ø 16 years)	25.7	approx. 0.21 million t CO_2e over the entire impact period (Ø 16 years)

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5. Agriculture, forestry, natural landscapes and biodiversity

The agricultural and forestry sector, more than any other area of the economy, is under direct pressure to adapt to the effects of climate change and to protect natural resources, ecosystems and biodiversity. The sector also plays a key role in climate protection.

With around 62 million tonnes of CO_2 equivalents, the agricultural sector accounted for 9.6% of total German emissions in 2024. Compared to the previous year, agricultural emissions fell by around 1.3%.[54] The sector also includes land use, land-use change and forestry (LULUCF) measures. LULUCF takes into account all land-based sources and sinks of greenhouse gas emissions from inhabited areas, wetlands, forests, arable land and grassland. This includes, for example, the release of greenhouse gases through deforestation, soil cultivation and ploughing-up of grassland, or the removal of carbon dioxide from the atmosphere through biomass growth in forests (sinks) and through wood products. In general, the LULUCF sector acts as a sink for carbon dioxide in Germany. The LULUCF sector emitted about 51 million tonnes of CO_2 equivalents to the atmosphere in 2024.[55] This was driven by consequences of climate change such as droughts or beetle infestations.

Agriculture and forestry, as a sector of the economy that covers the whole of Germany, thus play a key role in achieving Germany's overall sustainability, land use and climate goals.

The sector's eligible expenditures in 2022 amounted to €717.9 million and were distributed across 24 budget items. The sector's eligible expenditures in 2023 amounted to €909.4 million and were distributed across 30 budget items. For both years, the budget items can be assigned to the following subsectors:

	2022		2023	
Subsector	**Eligible expenditures (in € million)**	**Number of budget items**	**Eligible expenditures (in € million)**	**Number of budget items**
Agriculture	69.2	5	90.2	6
Land use, land-use change and forestry (LULUCF)	201.8	9	311.5	12
Biodiversity and natural landscapes	219.8	6	294.1	8
Coastal and flood protection	227.1	4	213.6	4

[54] See p. 21 of the Climate Action Report 2025 and the predicted greenhouse gas emissions balance published by the Federal Environment Agency, see https://www.umweltbundesamt.de/en/press/pressinformation/germany-on-track-for-2030-climate-targets

[55] See p. 84 of the Climate Action Report 2025

5.1. Agriculture

5.1.1. Subsidies to fund organic farming (BÖL)

	2022	2023
Budget chapter and item:	1005 686 43	
Eligible expenditures:	€12.4 million	€14.5 million
GHG emission reduction:	Not available	Not available
Subprojects:	221	229
Funding share:	Subsidy depending on the EU Regulation	Subsidy depending on the EU Regulation
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) d) e) f)	

Assumptions and limitations: The funding share is based on EU Regulations No 651/2014, 702/2014 and 2022/2472; as a rule it is 100% for universities, governmental research and other research and knowledge-transfer institutions.

Links:
https://www.bundesprogramm.de/
https://www.bundesprogramm.de/foerderung/foerderung-von-forschungs-und-entwicklungsvorhaben
https://www.oekolandbau.de/forschung/boel-forschungsergebnisse/

The objective of the Federal Scheme for Organic Farming (BÖL) (prior to mid-2022: Federal Scheme for Organic Farming and Other Forms of Sustainable Agriculture (BÖLN)) is to improve conditions for organic farming and the organic food industry and to enable the sustainable and balanced growth of this sector. The scheme focuses on funding research projects along the entire value chain in the organic farming and food sector and disseminating the findings in practice. BÖL also includes training and awareness-raising measures along the entire value chain, from producers through to consumers. Through its various funding measures, BÖL is contributing significantly to achieving to expanding and strengthening the organic farming and food sector.

The eligible expenditures in the BÖL scheme relate to research and development projects, including knowledge transfer. Funding is provided for projects on sustainable and organic cultivation and livestock farming practices. These mainly relate to the following areas:

- Environmentally friendly and organic crop production (including risk mitigation in crop protection, in particular through the use of non-chemical and biological crop protection methods, reducing erosion, soil and nutrient conservation by means of low-tillage cultivation methods, and maintenance of soil fertility, in particular by maintaining humus content on farmed land at levels characteristic of the location)
- Optimising nitrogen and energy input (including through the cultivation of legumes, efficient fertiliser and pesticide use and reductions in greenhouse gas emissions)
- Breeding research as a basis for breeding varieties that are well-suited to sustainable, organic production, processing and marketing
- Safeguarding and sustainably increasing yields, for example by tapping the potential of genetic resources

- Furthering the development of high-welfare, climate-friendly livestock farming practices (such as systems for providing livestock with access to the open air)
- Development of feeding strategies suitable to the species and optimised to reduce emissions of greenhouse gases per unit of animal-based food produced
- Input/output-efficient food processing

Quantification of impacts, such as CO_2 reduction potential, is not possible for research and development projects whose outcomes will only be applied in the future following project completion. Areas with potential include:

- Increasing sustainability in crop and livestock production
- Resource-efficient, sustainable and climate change-adapted crops
- Soil and nutrient management as a contribution to climate change mitigation
- Reduction in the use of inputs generated on the basis of fossil raw materials (such as peat, fertilisers and pesticides)
- Ensuring sustainable nutrition for farm animals under changing climatic conditions
- Strengthening regional value chains and enhancing the resilience of sustainable cultivation and production systems
- Reduction of emissions

The following joint projects can be cited as examples of eligible expenditures:

Project name (click on the project name to visit the website)	**Eligible expenditures (in € million)**		**Number of subprojects**
	2022	**2023**	
NutriNet – Expert/practitioner network to improve nutrient management in organic farming (identifiers 2818OE014, 067, 068, 069, 070, 071, 072, 073, 074, 075)	0.99	0.95	10
ProBio – Studies on the optimum production and agronomic use of compost from organic and green waste in organic farming (identifiers 2818OE009, 118, 119, 120, 121, 122) https://www.mdpi.com/2077-0472/13/3/740	0.26	0.31	6
TerÖko –Peat-reduced and peat-free substrates for organic herb production – testing, optimisation and knowledge transfer (identifiers 2819OE070, 140, 141, 142, 146)	0.21	0.34	5
ÖkoHuhn2 – Dual-purpose chickens in organic farming – breeding and potential identification of suitable origins and implementation in practice (identifiers 2819OE044, 061, 086, 087, 116)	0.82	0.83	5
ZuchtmetPopMais – Breeding methods, yield performance and adaptability of maize populations and development of a diverse population for science, breeding and practical agriculture (identifiers 2815NA106, 169, 170, 171, 200)	0.05	0	5
ComBee – Interactions between landscape structure and combined agri-environmental measures on the diversity, population development and health status of wild bees and honey bees (identifiers 2819OE115, 2819OE156)	0.34	0.16	2

Project name (click on the project name to visit the website)	Eligible expenditures (in € million)		Number of subprojects
	2022	2023	
WebMan – Web-based nutrient management in organic farming (identifiers 2818OE010, 050, 051, 052, 053)	0.41	0.47	5
Oekoapfelforward – Development of strategies to maintain and improve yield stability and the use of functional biodiversity, as well as to reduce the use of plant protection products in organic dessert apple cultivation (identifiers 2822OE139, 150, 151, 152, 153, 154, 210)	0	0.44	7
ReBIOscover – Rediscovering regional grain varieties for the sustainable production of organic food specialities (identifiers 2819OE021, 133, 134, 135)	0.25	0.24	4
VORWERTS – Use of ecological raw materials from mixed cultivation in regional value chains as a living lab (identifiers 2822OE090)	0	0.15	1

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5.1.2. Funding of innovation in the area of food, agriculture and health-related consumer protection

	2022			2023		
Budget chapter and item:	1005 686 31 and 1005 893 31					
Eligible expenditures:	€46.5 million			€45.2 million		
GHG emission reduction:	Not available			Not available		
Subprojects:	793			823		
Funding share:	approx. 75%			approx. 75%		
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	b)	c)	a)	b)	
	d)	e)	f)	d)		
Assumptions and limitations: --						
Links: www.innovationsfoerderung-bmel.de						

The aim of the programme is to support technical and non-technical innovations in Germany. Funding is provided for projects in areas such as agricultural engineering, crop breeding, crop protection, livestock breeding, livestock farming and livestock health, food safety and quality, nutrition, food production, aquaculture and fisheries.

Quantification of impacts, such as CO_2 reduction potential, is not possible for research and development projects whose outcomes will only be applied in the future following project completion. Areas with potential include:

- Increasing sustainability in crop and livestock production and urban farming
- Resource-efficient and climate change-adapted crops
- Soil as a contribution to climate change mitigation
- Reduction in the use of inputs generated on the basis of fossil raw materials (such as peat, fertilisers, pesticides (non-chemical pesticides) and plastic packaging)
- Ensuring sustainable nutrition for farm animals under changing climatic conditions
- Efficiency gains and input reduction through digitalisation and AI in production and the value chain
- Reduction of emissions in livestock farming
- Promotion of sustainable, climate-friendly and environmentally friendly aquaculture, including algae and in particular microalgae.

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5.1.3. Arable Farming Strategy

	2022	2023
Budget chapter and item:		1005 686 42
Eligible expenditures:		€12.8 million
GHG emission reduction:		Not available
Projects:		32
Beneficiaries:		119
Funding share:		Subsidy depending on the EU Regulation
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) e) f)	

Assumptions and limitations: --

Links:
https://www.ble.de/EN/Project-Funding/Themes-ptble/Climate-Mitigation/climate-change.html

A range of goals are being pursued with the implementation of the Federal Ministry of Food and Agriculture's Arable Farming Strategy 2035 (*Ackerbaustrategie 2035*). These include enhancing soil protection, increasing soil fertility, increasing crop diversity, and expanding crop rotations. Other goals include increasing the efficiency of fertilisers and reducing nutrient surpluses, strengthening integrated plant protection and reducing undesirable environmental impacts, developing resilient and site-adapted species and varieties, and making optimal use of digitalisation. The Arable Farming Strategy also aims to strengthen biodiversity in the agricultural landscape, develop climate-adapted cultivation models, expand climate protection measures in arable farming, exploit synergies, and strengthen knowledge and advice systems.

Under the Arable Farming Strategy budget item, funding is provided in particular for arable farming model and demonstration projects, as well as research and development projects that support the goals of the Arable Farming Strategy 2035, in the areas of plant cultivation, crop protection, biodiversity, climate adaptation and climate-friendly nitrogen management/improvement of nutrient efficiency that contribute to the specified goals. The biggest projects are listed below:

Joint project name (acronym in brackets)	**Eligible expenditures (in € million)**	**Number of beneficiaries**
Computer-aided prognoses and decision support systems in crop protection (ValiProg)	0.67	2
Development of digital forecasting models and decision support systems in crop protection for estimating pest insect infestations in rapeseed, sugar beet and corn (EntoProg)	1.13	4
Multiparametric monitoring of nitrate loads in agriculture (MoNi)	1.83	1
Measures to reduce direct and indirect emissions that impact the climate caused by denitrification in agricultural soils (MinDen)	0.77	5
Location-specific evaluation and crediting of nitrification inhibitors as a climate mitigation tool in crop production (NitriKlim)	0.89	8
Location-specific modelling of N dynamics to reduce gaseous N emissions and other N losses in crop production (smart_MaN2agement)	0.54	5
Demonstration farms for integrated crop production in arable farming (MuD IPB)	0.64	10
Use of NIR sensors to quantify nutrient content in liquid manure (MuD NIRS)	0.52	4
Acidification of slurry and fermentation residues during application in growing crops (Saeure_plus_im_Feld)	0.90	8
Implementation of regional nutrient strategies in slurry treatment (SlurryUpgrade)	0.53	5

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5.1.4. Subsidies to fund measures for improving energy efficiency in agriculture and horticulture (including investments)

	2022	2023
Budget chapter and item:	6092 686 22 and 6092 893 07	
Eligible expenditures:	€10.3 million	€17.7 million
GHG emission reduction:	0.023 million t CO_2e	0.036 million t CO_2e
Beneficiaries:	1,113	1,544
Funding share:	Investments: 30.3% Energy advice: 80%	Investments: 31.9% Energy advice: 80%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	

Assumptions and limitations:

The data on reductions and the number of beneficiaries relates to the projects for which funding was paid out in 2022 and 2023, some of which began to be implemented in 2021 or 2022. The eligible expenditures comprise expenditures to fund energy advice and investment projects. The sum total of GHG emission reductions is based on expert appraisals for each individual project and relates to the investment projects.

The applicant engages an energy consultant registered with the Federal Office for Agriculture and Food (*Bundesanstalt für Landwirtschaft und Ernährung*), who provides a report determining the GHG reduction that an agricultural undertaking can achieve by making an investment. Depending on the circumstances, the methods used include measuring energy consumption, using technical data, and collecting full or partial data on energy savings and reductions in fossil fuel consumption and making projections based on this data. In each case, the GHG reduction is calculated based on the CO_2 equivalents of the energy sources saved. This consulting service is also eligible for funding. The applicant submits the report when applying for the investment funding. Specific GHG reductions cannot be attributed to the funding of energy advice for individual enterprises as the consulting only identifies an enterprise's potential reductions. In about 70% of cases, however, the funded consulting lead to investment measures applied for and funded under the programme.

Links: https://www.ble.de/energieeffizienz

The "Federal programme to enhance energy efficiency and reduce carbon emissions" (*Bundesprogramm Energieeffizienz und CO_2-Einsparung*) supports agricultural and horticultural businesses on their path to a more climate-friendly future. Targeted incentives support efforts to establish climate-friendly technologies and renewable energy and heat generation for primary production.

SMEs in the agricultural and horticultural sector, in particular, can receive financial support for investment measures to mitigate climate change through technology. This includes investments in the procurement or retrofitting of cross-sectional technologies (listed in a "positive list"), complex energy efficiency investments and the installation of renewable energy generation systems for a businesses' own use. The prerequisite is that these investments enable significant CO_2 savings or contribute to making energy-efficient district heating and cooling networks available to agricultural businesses. Projects involving the use of district heating or cooling are also eligible for funding.

In addition, there are funding options for energy efficiency measures that reduce the energy consumption of agricultural machinery or that improve energy efficiency by means of alternative drive options such as electrification or the conversion of engines to run on sustainable biofuels.

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5.2. Land use, land-use change and forestry (LULUCF)

5.2.1. Subsidies to fund research, development and demonstration projects in the area of renewable resources and to fund national sustainable forestry projects (including investments)

- Subsidies to fund research. development and demonstration projects in the area of renewable resources and to fund national sustainable forestry projects
- Subsidies to fund research. development and demonstration projects in the area of renewable resources (investments)
- Subsidies to fund the sustainable use of wood
- International sustainable forest management

	2022	2023
Budget chapter and item:	1006 687 06, 1005 686 11, 1005 893 11 and 1005 686 15	
Eligible expenditures:	€44.9 million	€49.6 million
GHG emission reduction:	Not available	Not available
Projects:	1,081 ongoing projects, 261 of them newly approved	1,091 ongoing projects, 256 of them newly approved
Beneficiaries:	439	452
Funding share:	687 06: 100% Remainder: 90.1%	687 06: 100% Remainder: 88.2%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b) d) e) f)	

Assumptions and limitations:
687 06: Most of the projects run for three years. The project participants are predominantly universities and government research institutions that receive 100% funding.
Beneficiaries provided with funding from multiple budget items are only counted once in the total of all beneficiaries.

Links:
https://www.ble.de/EN/Topics/Forest-Timber/forest-timber_node.html
https://international.fnr.de/

The funding programme "Sustainable Renewable Resources" (*Nachwachsende Rohstoffe*) funds research, development and demonstration projects in the area of renewable resources. The programme pursues a wide variety of objectives, including efficient and climate-friendly resource use, carbon avoidance and sequestration, and protecting biodiversity. Quantification of impacts, such as CO_2 reduction potential, is not possible for research and development projects whose outcomes will only be applied in the future following project completion. The following projects can be cited as examples of eligible expenditures under the specified budget items.

Project name (click on the identifier to visit the website)	2022			2023		
	Eligible expenditures (in € million)	Number of beneficiaries	Number of projects	Eligible expenditures (in € million)	Number of beneficiaries	Number of projects
Budget item 1005 686 11 – total	**22.3**	**239**	**464**	**23.2**	**231**	**447**
Joint project Outreach 2220NR309A, 2220NR309B, 2220NR309C, 2220NR309D	0.09	2	3	0.27	3	4
Joint project FSS 2221NR042A, 2221NR042B	0.11	2	2	0.22	2	2
Joint project NaKuRa 2220NR267A, 2220NR267B	0.10	2	2	0.17	2	2
Budget item 1005 893 11 – total	**13.9**	**235**	**429**	**13.7**	**220**	**383**
Joint project FInAL_II 2221NR094A, 2221NR094B, 2221NR094C, 2221NR094D, 2221NR094E	0.18	5	5	1.10	5	5
Joint project SUGRA 2220NR168A, 2220NR168B, 2220NR168C	0.07	3	3	0.30	3	3
Joint project BioFolPack 2220NR278A, 2220NR278B, 2220NR278C, 2220NR278D, 2220NR278E, 2220NR278F, 2220NR278G	0.08	7	7	0.24	7	7
Budget item 1005 686 15 – total	**7.2**	**92**	**175**	**10.9**	**129**	**248**
Joint project DiKieHo 2221HV082A, 2221HV082B	0.08	2	2	0.24	2	2
Joint project Buchendaemmstoffe 2221HV003A, 2221HV003B, 2221HV003C	0.05	3	3	0.20	3	3
Joint project TANIPU 2220HV067A, 2220HV067B, 2220HV067C, 2220HV067D	0.02	4	4	0.34	4	4
Budget item 1006 687 06 – total	**1.5**	**Not available**	**13**	**1.8**	**Not available**	**13**

The following example projects contribute to promoting bilateral research cooperation and knowledge exchange for international sustainable forest management. The goal is to support the transition to sustainable forest management in forests worldwide and ultimately to counteract the ongoing destruction and degradation of forests.

Example 1: The project "KLIMNEN" is a cooperation between the University of Göttingen and HAWK University of Applied Sciences and Arts in Göttingen. The project is comparing central European beech forests (Fagus sylvatica) with southern beech forests in central Patagonia (Nothofagus spp.) and providing insights into the sustainable management of temperate deciduous and mixed deciduous forests worldwide.

The aim of the project is to investigate how the trees adapt to climate change and react to extreme weather events and disturbances and to analyse the vulnerability and resilience of the trees' ecosystems in a comparative study. The complex interactions between natural events, such as forest fires, and the current, often unsustainable, use of forests are also taken into account.

The opportunities and risks associated with the use of non-native tree species in these habitats are also assessed and discussed. The findings will be used to draw conclusions for a functioning ecosystem and the conservation and restoration of biodiversity. Another objective is to develop recommendations for minimising risks in forestry and restoring ecosystem services through functional forest renaturation.

The area in central Patagonia to be studied in the comparative project encompasses the Río Puelo watershed. The area in central Europe (western Romania) was already studied as part of the predecessor project NEMKLIM.

Example 2: The natural regeneration of rainforests in eastern Africa following economic exploitation is the subject of the University of Göttingen's "Recovery" project. Research being carried out in the Budongo Forest Reserve aims to provide insights into the development of targeted, sustainable and site-specific approaches to regeneration after logging.

In cooperation with local project partners, the aim is to establish a network of long-term research areas in forest stands that represent different stages of regeneration after logging. By mapping the forest structure using laser scanners and through long-term monitoring of tree growth, data will be collected and analyses of structural regeneration and the increase in growing stock will be carried out.

The results will be used to understand how rainforests regenerate and thus to enable the restoration of degraded rainforest ecosystems. In joint workshops with local stakeholders working in the areas of forestry and nature conservation, the project results will then be prepared and presented in an accessible way so that they can be put into practice.

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5.2.2. Forestry measures

- Grants to fund forestry measures (including investments)
- Grants to adapt forests to climate change (including investments)

	2022	2023
Budget chapter and item:	Annex 1 to 1003 (1095) 632 41, 882 41, 632 42 and 882 42	
Eligible expenditures:	€131.1 million	€118.2 million
GHG emission reduction:	Not available	Not available
Funding cases:	60,946	59,082
Reforested area:	8,990 ha	8,340 ha
Grant-aided area for sowing and planting as part of initial afforestation:	154 ha	155 ha
Grant-aided area under contractual nature conservation:	45,135 ha	39,305 ha
Processed infested wood:	8,956,437 m³	7,709,049 m³
Funding share:	60%	60%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b)	f)

Assumptions and limitations:
GAK reporting by the *Länder*, reporting period 2022 and 2023
The indicators relate to a funding share of 100% (federal funds, *Länder* funds, EU funds and other public funds in accordance with the report).

Links:
https://www.bmleh.de/EN/topics/rural-regions/rural-development-support/gak.html
https://www.bmel-statistik.de/fileadmin/daten/0002000-2022.pdf
https://www.bmel.de/DE/themen/wald/wald-in-deutschland/duerrehilfen-waldbesitzer.html
https://www.bmel-statistik.de/fileadmin/daten/5000100-2022.pdf
https://www.bmel-statistik.de/fileadmin/daten/0002000-2023.pdf
https://www.bmel-statistik.de/fileadmin/daten/5000100-2023.pdf

The Joint Task of the federal government and *Länder* for the Improvement of Agricultural Structures and Coastal Protection (*Gemeinschaftsaufgabe Verbesserung der Agrarstruktur und des Küstenschutzes*, GAK) is the most important national funding instrument for efficient, competitive agriculture and forestry geared to future requirements, coastal protection and vibrant rural areas. It comprises a wide range of agricultural structure-related and infrastructure measures and thus largely falls within the scope of the European Agricultural Fund for Rural Development (EAFRD).

Details regarding the principles, aims and procedural issues are regulated in the Act on the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK Act). Budgeting for the Joint Task takes the form of four-year framework plans drawn up by the federal government and the *Länder*. The GAK framework plan lists the measures,

including the associated aims, and describes the funding principles, funding recipients, funding requirements, and the type and amount of funding. The GAK framework plan is adopted by the Planning Committee for Agricultural Structure and Coastal Protection (PLANAK), which brings together the federal and *Länder* ministers of agriculture and the Federal Minister of Finance. It applies throughout the financial planning period and is reviewed annually and adjusted to current developments.

With the help of the above-mentioned funds, measures in the following areas were financed in 2022 and 2023 (federal share: 60%, *Länder* share: 40%) and implemented by the *Länder*:

- **Close-to-nature forest management** (2022: 14,558 funding cases; indicator: 8,990 ha reforested area and 2023: 11,381 funding cases; indicator: 8,340 ha reforested area):
  Forest transformation is an aspect of close-to-nature forest management. Measures in this area that are eligible for funding include reforestation and establishing undergrowth (including natural regeneration) by sowing and planting site-adapted tree and shrub species. This includes preparing the ground for cultivation and forest edge formation, as well as protecting and maintaining the cultivated area for the first five years. A sufficient proportion of native tree species must be maintained.
- **Initial afforestation** (2022: 4,196 funding cases; indicator: 154 ha grant-aided area for sowing and planting as part of initial afforestation, and 2023: 2,198 funding cases; indicator: 155 ha grant-aided area for sowing and planting as part of initial afforestation):
  Initial afforestation includes, for example, sowing and planting, in each case including crop preparation, forest edge formation and protecting the cultivated area for the first five years. It also includes preparatory surveys such as site assessments.
- **Contractual nature conservation in forests** (2022: 5,215 funding cases; indicator: 45,135 ha of grant-aided area under contractual nature conservation in forests, and 2023: 4,823 funding cases; indicator: 39,305 ha grant-aided area under contractual nature conservation in forests):
  Measures financed under the "Contractual nature conservation in forests" (*Vertragsnaturschutz im Wald*) instrument aim to protect, conserve and restore forest habitats of wild animal and plant species and to improve the characteristic biodiversity of forest ecosystems. Funding is provided for the management, maintenance or set-aside of land that is or could be used for forestry.
- **Combating the effects of extreme weather events in forests** (2022: 36,977 funding cases; indicator: 8,956,437 m^3 of processed infested wood, and 2023: 40,680 funding cases; indicator: 19,740,585 m^3 processed infested wood):
  Forest protection measures as part of measures to combat the effects of extreme weather events in forests include combating harmful organisms by locating and processing infested timber (e.g. sanitary felling, debarking, bark disposal and extracting and transporting timber) and other measures to reduce the host suitability of timber, timber waste or brushwood so that the material does not pose, or ceases to pose, a hazard.

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5.2.3. Forest Climate Fund

	2022	2023
Budget chapter and item:	6092 686 06	
Eligible expenditures:	€25.8 million	€25.2 million
GHG emission reduction:	Not available	Not available
Beneficiaries:	111	97
Projects:	279 ongoing projects, 61 of them newly approved	257 ongoing projects, no newly approved projects
Funding share:	99.2%	99.2%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	b)	f)

Assumptions and limitations:
The indirect impact of research results means that specific GHG reduction figures cannot be quantified and stated. No new projects were approved in 2023.

Links:
https://www.waldklimafonds.de/

The Federal Ministry of Food and Agriculture (BMEL) and the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) use funds from the Climate and Transformation Fund to support measures through the Forest Climate Fund funding guidelines to preserve and enhance the carbon reduction potential of forests and timber and to adapt forests to climate change. In the 2022 fiscal year, the two ministries spent a total of €25.8 million on supporting projects through the jointly managed Forest Climate Fund. A total of 61 projects were newly approved in the 2022 reporting year. These are distributed among the funding priorities set out in the Forest Climate Fund's funding guidelines as follows:

- Increasing timber product carbon storage, CO_2 reduction and substitution with timber products (5 projects)
- Research and monitoring (56 projects)

The Forest Climate Fund aims to implement measures of special national interest that help forests adapt to climate change and that maintain the indispensable contribution made by near-natural, structurally- and species-rich forests to safeguarding natural ecosystems in the long term. The BMEL and BMUV have used the Forest Climate Fund since 2013 primarily to support research, development and demonstration projects as well as communication and exchange between the scientific community and practitioners on the topics of forest climate change mitigation and adaptation. The federal government's climate, environmental and nature conservation objectives are supported by the following sub-objectives:

- Preservation and development of near-natural forest ecosystems
- Maintenance and improvement of climate-action and biodiversity measures in forests, including soil and water protection
- Forest transformation and adaptation towards climate-resilient, near-natural forests
- Supporting the vitality and maintaining the productivity of forests and their sustainable, near-natural management

In the 2023 fiscal year, the two ministries spent a total of €25.2 million on funding projects through the jointly managed Forest Climate Fund. No further projects could be approved in the 2023 reporting year, as the Forest Climate Fund funding guidelines expired on 31 December 2022 and no new funding guidelines were published. Funding was provided only in the form of commitment appropriations for the Forest Climate Fund via the Climate and Transformation Fund in order to continue supporting already approved projects.

	2022			2023		
Project name (click on the identifier to visit the website)	**Eligible expenditures** (in € million)	**Number of beneficiaries**	**Number of projects**	**Eligible expenditures** (in € million)	**Number of beneficiaries**	**Number of projects**
Budget item 6002 686 06 – total	**25.8**	**111**	**279**	**25.2**	**97**	**257**
Joint project MultiRiskSuit 2220WK41A4, 2220WK41B4, 2220WK41C4, 2220WK41D4, 2220WK41E4, 2220WK41F4, 2220WK41G4, 2220WK41H4	0.17	5	5	1.38	8	8
Joint project WiWaldl 2221WK24A4, 2221WK24B4, 2221WK24C4, 2221WK24D4	0.26	4	4	0.51	4	4
Joint project FEMOPHYS 2220WK80A4, 2220WK80B4, 2220WK80C4, 2220WK80D4, 2220WK80E4, 2220WK80F4	0.10	5	5	0.57	6	6

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5.2.4. Measures to protect peat soils

- Subsidies to promote measures to protect moor soils and to reduce the use of peat
- Subsidies to promote measures to build up humus

	2022	2023
Budget chapter and item:		6092 686 20 and 6092 686 21
Eligible expenditures:		€12.9 million
GHG emission reduction:		Not available
Beneficiaries:		67
Projects:		91 ongoing projects, 47 of them newly approved
Demonstration projects by farms in the area of humus:		150
Funding share:		98–100%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b)	e)

Assumptions and limitations: Since these are model or research projects, no immediate reductions in GHG emissions are to be expected. It may be possible to determine potential reductions at a later date, once the knowledge gained by the participating farms has been shared with the wider agricultural community and after the research results have been put into practice.

Links:
https://moor.fnr.de/
https://torfersatz.fnr.de/
https://www.ble.de/DE/Projektfoerderung/Foerderungen-Auftraege/Bundesprogramm_Humus/Humus_node.html

Peat soil protection:

The measures are intended to contribute to the German government's climate action targets in accordance with the federal-*Länder* target agreement on climate change mitigation through peat soil conservation 2021 *(Bund-Länder-Zielvereinbarung zum Klimaschutz durch Moorbodenschutz 2021*), the Climate Action Programme 2030 and the Climate Action Act. One goal of the federal-*Länder* target agreement is to reduce annual GHG emissions from peatlands by five million tonnes of CO_2 by 2030. By raising water levels in peat soils used for agricultural purposes, emissions can be reduced by 15 to approx. 25 tonnes of CO_2 equivalents/ha per year, depending on the initial and target situations. The ongoing model and demonstration projects determine GHG emissions and reduction potential, and collect data on other ecological (soil, water, biodiversity, etc.) and economic parameters.

Furthermore, the measures aim to significantly reduce GHG emissions from drained peat soils and to promote the use of peat substitutes in horticulture. The Federal Ministry of Food and Agriculture published a Peat Use Reduction Strategy in 2022, which focuses on voluntarily using alternatives to peat in potting soils, crop substrates and soil improvement products. The actual availability of substitutes in Germany is of considerable

significance in this regard. During the strategy's implementation over the coming years, the aim is to resolve issues relating to substrate production, horticultural use, competing uses, price, economic efficiency, environmental impact over a product's life cycle, and sustainability, including the environmental impact of transporting raw materials. The Johann Heinrich von Thünen Institute estimates that a reduction of around 0.1 to 1.0 million tonnes of CO_2 equivalents per year is possible if more than 50% of peat is replaced by peat substitutes.

In the area of peat soil protection, funds are being used for the following purposes:

- Intensifying research into paludicultures and how they can be used
- Carrying out model and demonstration projects to examine the effects of rewetting peatlands and creating paludicultures, as well as establishing value chains

In addition, measures are being implemented to reduce the use of peat in horticulture:

- Intensifying research into peat substitutes
- Carrying out model and demonstration projects in the areas of commercial horticulture and private gardening
- Compiling specialist information and creating consulting opportunities for horticultural businesses
- Certifying peat substitutes, informing the public about alternatives to gardening soils that contain peat, and providing training for specific user groups

Humus formation:

Humus in agricultural soil is crucial for supporting soil life and soil fertility, maintaining the water balance, providing nutrients and reducing erosion. Humus also sequesters large amounts of carbon. Humus in soils is the largest terrestrial reservoir of organic carbon. This is also true for Germany, where 2.5 billion tonnes of carbon is stored in agricultural soils (mineral and peat soils), making them the largest carbon pool in Germany's agricultural and forest ecosystems.

Loss of organic carbon in the soil through mineralisation results in CO_2 emissions. In agricultural soils, this loss can be prevented by agronomic measures that introduce organic matter to the soil, and additional CO_2 can be sequestered where applicable. Permanent increases in humus content can only be achieved over longer periods of time and to a limited extent.

The federal government's Climate Action Programme 2030 aims to increase the carbon sequestration potential of agricultural soils. As part of the Federal Humus Programme (*Bundesprogramm Humus*), the Federal Ministry of Food and Agriculture (BMEL) is therefore implementing various measures that contribute to generating knowledge on how to increase and preserve humus in agriculture and disseminating this knowledge as widely as possible in order that it can be integrated in agricultural practice. By funding model and demonstration projects as well as research and development projects, the aim is to encourage the widespread implementation of humus-increasing and humus-preserving measures and strategies in agricultural practice.

For 2023, the following projects can be cited as examples of eligible expenditures under the specified budget items:

Project name (click on the identifier to visit the website)	Eligible expenditures (in € million)	Number of beneficiaries	Number of projects
Budget item 6002 686 21 – total	**10.0**	**54**	**87**
Joint project WetNetBB 2222MT005A, 2222MT005B, 2222MT005C, 2222NR078D, 2222MT005E	0.65	5	5
Joint project PaludiZentrale 2222MT009A, 2222MT009B, 2222MT009C	0.34	3	3
Joint project MOOSland 2222MT010A, 2222MT010B, 2222MT010C, 2222MT010D, 2222MT010E, 2222MT010F, 2222MT010G, 2222MT010H	0.48	8	8
Budget item 6002 686 20 – total	**2.9**	**13**	**4**
Joint project HumusKlimaNetz 2821HUM001, 2821HUM002, 2821HUM003	2.24	3	1
Individual project HUMUSMod 2821HUM005	0.22	1	1
Joint project HUMAX 2822HUM010, 2822HUM020, 2822HUM030, 2822HUM040, 2822HUM050, 2822HUM060	0.46	6	1
Joint project BC-LOOKUP 2823HUM004, 2823HUM005, 2823HUM006	0.04	3	1

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5.2.5. Financial support for forests' contributions to sustaining ecosystems and for climate-adapted forest management

	2022	2023
Budget chapter and item:		6092 686 30
Eligible expenditures:		€105.6 million
GHG emission reduction:		Not available
Beneficiaries:		8,652
Funded forest area:		1,552,409 ha
Funding share:		Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b)	f)

Assumptions and limitations: --

Links: https://www.klimaanpassung-wald.de/

This measure also implements the "Recognition of the ecosystem services provided by forests" (*Honorierung der Ökosystemleistung des Waldes*) measure from the 2021 Climate Pact.

Forests need to be climate resilient in order to fulfil important climate protection functions in the long term. The goal of increasing the resilience and adaptability of forest ecosystems can only be achieved if forest owners pursue sustainable forest management and take responsibility for making their forests more resilient. The purpose of the measure is to change forest management practices by introducing and promoting a form of forest management specifically adapted to climate change that maintains and develops resilient, adaptable and productive forests. The funding guidelines of the "Climate-adapted forest management" (*Klimangepasstes Waldmanagement*) programme include 11 or 12 criteria that go beyond the requirements of the certification systems currently used by the forestry sector in Germany. Private and public-authority forest owners can receive funding if they commit to complying with these 11 or 12 criteria across the entire managed forest area over a period of 10 or 20 years. Proof of compliance with the criteria is provided in the form of a certificate confirming that the requirements of a recognised certification system under the guidelines have been met. Compliance is also monitored with a control procedure developed specially for this purpose.

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5.3. Biodiversity and natural landscapes

5.3.1. Restoration of ecological continuity and measures for ecological development along federal waterways

	2022	2023
Budget chapter and item:	1203 780 05	
Eligible expenditures:	€6.4 million	€ 3.4 million
GHG emission reduction:	Pursues other objectives	Pursues other objectives
Measures:	19	26
Funding share:	100%	100%
EU environmental objectives under Article 9 of the Taxonomy Regulation:		f)

Assumptions and limitations:

Ecological (river) continuity:

This is a multi-year project. As a result, the eligible investments for the individual years 2022 and 2023 represent a fraction of the total investments for the listed projects.

No fish ladders were completed in the 2022 and 2023 fiscal years. For completed fish ladders, the number of kilometres with restored river continuity along federal waterways can be used as an indicator in the future. The measures taken along federal waterways also open up tributaries that are managed by the *Länder* for migratory fish, thus creating a much larger catchment area than can be indicated solely by the number of kilometres migrated along federal waterways.

Hydromorphological measures:

This is a multi-year project. As a result, the eligible investments for the individual years 2022 and 2023 represent a fraction of the total investments for the listed projects.

The Federal Waterways and Shipping Administration (*Wasserstraßen- und Schifffahrtsverwaltung des Bundes*) primarily operates on the banks of federal waterways, as legally and geographically its competencies do not extend beyond these waterways. From an ecological perspective, river and floodplain projects should be linked wherever possible in order to achieve ecological connectivity between river, riverbank and floodplain biotopes. The federal programme “Blue Ribbon Germany” (*Blaues Band Deutschland*) gives preference to project proposals that can be linked in this way. Projects with a focus on floodplains can then be implemented via the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection’s Floodplain Funding Programme (*Förderprogramm Auen*), while the Federal Waterways and Shipping Administration takes responsibility for water-management development measures on riverbanks. The Federal Agency for Nature Conservation is responsible for overseeing and implementing projects funded by the floodplain funding programme.

In future, the length of the riverbank or area developed under the responsibility of the Federal Waterways and Shipping Administration can be used as an indicator for completed measures.

Links:

https://bmdv.bund.de/DE/Themen/Mobilitaet/Wasser/Umweltschutz/umweltschutz.html

https://www.gdws.wsv.bund.de/DE/wasserstrassen/umwelt-oekologie/oekologische-durchgaengigkeit/oekologische-durchgaengigkeit-node.html

https://www.blaues-band.bund.de/Projektseiten/Blaues_Band/DE/00_Home/home_node.html

In 2000, the European Water Framework Directive (WFD) came into force, introducing extensive new rules for the protection of water bodies and water management in Europe. The aim of the WFD is to ensure that as many watercourses, lakes and groundwater bodies as possible reach a good ecological and chemical status within a quarter of a century.

The measures needed to achieve this goal include restoring river continuity. Fish and small invertebrates should be able to migrate freely upstream and downstream between their usual feeding, spawning and refuge habitats. If it is not possible to dismantle transverse structures such as locks and weirs, fish ladders will be installed to enable fish to pass around the barriers. Since 2010, the Federal Waterways and Shipping Administration has been responsible for ensuring river continuity at transverse structures in federal waterways that it operates or constructs.

The measures needed to achieve the objectives of the WFD also include the renaturation of water bodies, provided this does not have any significant adverse effects on human use. Since 2021, the Federal Waterways and Shipping Administration has been responsible for the upgrading of water-related resources (in this case: hydromorphological measures on the banks of federal waterways), insofar as these are necessary to achieve the objectives of the WFD. These measures restore habitats for animals and plants.

The measures and projects of the federal programme "Blue Ribbon Germany" (*Blaues Band Deutschland*), financed by the Federal Ministry for Digital and Transport, are also taken into account. The aim of the measures implemented through the "Blue Ribbon Germany" programme is to ensure that, by 2050, the secondary waterways and ecological stepping stones within the core network of federal waterways are functioning efficiently as part of a biotope network that extends across all German *Länder*.

In the 2022 and 2023 fiscal years, investments were made in the following multi-year projects, among others:

a) Measures to restore river continuity

Measure	Federal waterway	2022	2023
Fish ladder Regow	Upper Havel waterway	X	X
Fish ladder Zaaren	Upper Havel waterway	X	X
Fish ladder Schorfheide	Upper Havel waterway	X	X
Fish ladder Steinhavel	Upper Havel waterway	X	
Fish ladder Kostheim	Main	X	X
Fish ladder Eddersheim	Main		X
Fish ladder Wallstadt	Main		X
Fish ladder Altenberg	Lahn		X
Fish ladder Lehmen	Moselle		X
Fish ladder Kochendorf hydroelectric plant	Neckar	X	X
Fish ladder Lauffen	Neckar	X	X

b) Hydromorphological measures:

Measure “Groyne fields Schlüsselburg” (*Buhnenfelder Schlüsselburg*) (2022)

The aim of the project is to develop near-natural bank structures on a previously heavily modified section of the Weser riverbank by reconfiguring the bank areas into gently sloping and temporarily floodable riparian zones with indigenous vegetation. Area (after completion): 4 ha / 1 km riverbank.

Measure “Riverbank development Jössen” (*Gleituferentwicklung Jössen*) (2022)

The aim of the project is to improve the quality of the area as a habitat for the flora and fauna of seasonally and permanently wet floodplains. The project involved reconnecting existing floodplain structures to the Weser River, and ecologically enhancing the riverbank and riparian strip. Area (after completion): 8 ha / 1.5 km riverbank.

Measure “Wild island Pagensand” (*Wilde Insel Pagensand*) (2023):

The near-natural development of 40 hectares of the island of Pagensand aims to make the island an ecological stepping stone in the biotope network of the Elbe federal waterway. Dynamic processes and changes are being initiated with the planned measures. In particular, the goal is to connect the Elbe estuary (Tideelbe) and the island’s foreshore in order to re-establish suitable conditions for water-based habitats with and without tidal influence. Partial measures in the riparian zone and the marshland near the shore are implemented by the Federal Waterways and Shipping Administration.

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5.3.2. Grants for funding environmentally friendly land management geared to market and local conditions, including contractual nature conservation and landscape management (including investment in nature conservation)

	2022	2023
Budget chapter and item:	Annex 1 to 1003 (1095) 632 33 and 882 31	
Eligible expenditures:	€98.0 million	€67.6 million
GHG emission reduction:	Not available	Not available
Funding cases:	236,572	244,186
Grant-aided area:	4,473,422 ha	2,809,519 ha
Funded livestock units:	26,358	20,409
Grant-aided trees:	560,359	419,759
Funding share:	60%	60%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a) b)	f)

Assumptions and limitations:

GAK reporting by the *Länder*, reporting period 2022 and 2023

The indicators relate to a funding share of 100% (federal funds, *Länder* funds, EU funds and other public funds in accordance with the report).

According to the cash results for 2022 and 2023, the total expenditure for measures in the area of environmentally friendly land management geared to market and local conditions, including investment in nature conservation, funded through the GAK's funding area 4 (excluding measure groups F and J) amounts to approximately €98.9 million for 2022 and €68.2 million for 2023. In order to exclude potential expenditure on areas planted with hops or vines for wine grapes, these total expenditures were reduced by a flat rate of 0.73%. The percentage was calculated based on the proportion of land used for cultivating hops and grapes, using data from the Federal Statistical Office.

Figures for the two indicators "funding cases" and "grant-aided area" are only available for the total expenditures. According to 2022 and 2023 reporting, a total of 238,312 cases in 2022 and 245,982 cases in 2023, and areas of 4,473,422 ha in 2022 and 2,809,519 ha in 2023, were funded. In order to also provide approximate figures for these two indicators for the eligible expenditures of €98 million in 2022 and €67.6 million in 2023, these figures were also reduced by 0.73%.

Links:

https://www.bmleh.de/EN/topics/rural-regions/rural-development-support/gak.html
https://www.bmel-statistik.de/fileadmin/daten/4000100-2022.pdf
https://www.bmel-statistik.de/fileadmin/daten/0002000-2023.pdf
https://www.bmel-statistik.de/fileadmin/daten/4000100-2023.pdf

For general information on the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK), see section 5.2.2 "Forestry measures".

As well as contributing to environmental protection and climate action, these measures primarily aim to conserve and promote biodiversity, improve soil structure, and reduce fertiliser and pesticide use. The federal government contributes 60% of the funding costs, and implementation is carried out by the *Länder*.

When implementing agri-environment-climate measures (AECMs) or measures such as introducing or maintaining organic farming, farmers voluntarily commit to complying

with the AECM management requirements set out in the funding guidelines of the *Länder*, generally for a period of five years. The requirements stipulated in the funding guidelines must exceed the statutory minimum requirements.

The above-mentioned funds were used to support measures in the following areas:

- Cooperation in rural regions for climate-friendly land management geared to market and local conditions, including contractual nature conservation and landscape management (2022: 24 funding cases and 2023: 12 funding cases)
- Organic farming and other particularly sustainable whole-farm practices, divided into
    - organic farming practices (2022: 22,833 funding cases, indicator: 1,309,873 ha reforested area and 2023: 10,713 funding cases, indicator: 823,614 ha grant-aided area)
    - application of low-emission fertilisers that do not pollute bodies of water (2022: 18,471 funding cases, indicator: 707,404 ha grant-aided area and 2023: 85 funding cases and 25,389 ha grant-aided area)
- Particularly sustainable practices in arable farming and the cultivation of annual specialised crops (2022: 45,279 funding cases, indicator: 1,444,029 ha grant-aided area and 2023: 41,564 funding cases, indicator: 1,068,284 ha grant-aided area)
- Particularly sustainable practices on permanent grassland (2022: 48,134 funding cases, indicator: 623,715 ha grant-aided area and 2023: 57,453 funding cases, indicator: 526,485 ha grant-aided area)
- Particularly sustainable practices for permanent crops (2022: 12,040 funding cases, indicators: 6,275 ha grant-aided area and 560,359 grant-aided trees and 2023: 9,765 funding cases, indicators: 1,049 ha grant-aided area and 419,759 grant-aided trees)
- Conservation of the diversity of genetic resources in agriculture (2022: 2,496 funding cases, indicator: 26,358 funded livestock units and 2023: 1,731 funding cases, indicator: 20,409 grant-aided livestock units)
- Non-productive investment in nature conservation (2022: 1,037 funding cases and 2023: 556 funding cases)
- Contractual nature conservation (2022: 87,998 funding cases, indicator: 382,126 ha grant-aided area and 2023: 124,103 funding cases, indicator: 364,698 ha grant-aided area)

Farmers who commit to applying these measures contribute to the preservation of natural capital and ecosystem capacity, on which the economy and society depend in equal measure.

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5.3.3. Federal share of financing for the special framework programme for insect protection measures (including investments) (from 2023: federal share of funding for the special framework programme for organic farming and biodiversity measures

	2022	2023
Budget chapter and item:	Annex 1 to 1003 (1095) 632 97 and 882 97	
Eligible expenditures:	€54.8 million	€116.9 million
GHG emission reduction:	Not available	Not available
Funding cases:	71,488	83,663
Grant-aided area:	858,383 ha	1,264,289 ha
Funding share:	60%	60%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	f)

Assumptions and limitations:

GAK reporting by the *Länder*, reporting period 2022 and 2023

The indicators relate to a funding share of 100% (federal funds, *Länder* funds, EU funds and other public funds in accordance with the report).

According to the cash results for 2022 and 2023, the total expenditure for measures in the area of environmentally friendly land management geared to market and local conditions, funded via the special framework plan "Measures to promote insect protection in agricultural landscapes" (*Maßnahmen zum Insektenschutz in der Agrarlandschaft*) (2022) and the special framework plan "Organic farming and biodiversity" (*Maßnahmen des Ökolandbaus und der Biologischen Vielfalt*) (2023) amounts to approximately €55.3 million for 2022 and €117.8 million for 2023. In order to exclude potential expenditure on areas planted with hops or vines for wine grapes, these total expenditures were reduced by a flat rate of 0.73%. The percentage was calculated based on the proportion of land used for cultivating hops and grapes, using data from the Federal Statistical Office.

Figures for the two indicators "funding cases" and "grant-aided area" are only available for the total expenditures. According to 2022 and 2023 reporting, a total of 72,014 cases in 2022 and 84,279 cases in 2023, and areas of 864,696 ha in 2022 and 1,273,586 ha in 2023, were funded. In order to also provide approximate figures for these two indicators for the eligible expenditures of €54.8 million in 2022 and €116.9 million in 2023, these figures were also reduced by 0.73%.

Links:

https://www.bmleh.de/EN/topics/rural-regions/rural-development-support/gak.html
https://www.bmel-statistik.de/fileadmin/daten/0002000-2022.pdf
https://www.bmel-statistik.de/fileadmin/daten/7000300-2022.pdf
https://www.bmel-statistik.de/fileadmin/daten/0002000-2023.pdf
https://www.bmel-statistik.de/fileadmin/daten/7000400-2023.pdf

For general information on the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK), see section 5.2.2 "Forestry measures".

For a long time, measures for climate-friendly land management geared to market and local conditions have been funded under the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK). In the 2016 revision of the GAK Act, this funding area was supplemented and explicitly extended to include measures for climate-friendly land management including contractual nature conservation and landscape management. In order to reverse the decline in insect populations, existing measures need to be strengthened and new measures to promote insects need to be implemented. The funding for climate-

friendly land management geared to market and local conditions including contractual nature conservation and landscape management under the regular GAK framework plan will therefore be increased.

To meet the additional funding requirements for these priority measures, additional federal funding is being made available to the *Länder* under this special framework plan. This also enables the implementation of a key measure under the federal government's "Action Programme for Insect Protection" (*Aktionsprogramms Insektenschutz*). The federal government contributes 60% of the funding costs, and implementation is carried out by the *Länder*. The special framework plan "Measures to promote insect protection in agricultural landscapes" was renamed "Organic farming and biodiversity" in 2023.

For example, farms that commit to agri-environment-climate measures (AECMs) and provide areas of flowering vegetation for bees and other insects can apply for funding in their respective *Länder*.

Measures supported with the above funding in 2022 and 2023 include the following:

- organic farming practices (2022: 10,556 funding cases, indicator: 323,845 ha grant-aided area and 2023: 26,853 funding cases, indicator: 972,586 ha grant-aided area)
- integration of natural landscape features that give structure to the agricultural landscape (2022: 18,843 funding cases, indicator: 51,252 ha grant-aided area and 2023: 16,827 funding cases, indicator: 48,297 ha grant-aided area)
- particularly sustainable practices on permanent grassland (2022: 8,704 funding cases, indicator: 93,287 ha grant-aided area and 2023: 8,138 funding cases, indicator: 64,916 ha grant-aided area)
- non-productive investment in nature conservation (2022: 2,853 funding cases and 2023: 3,167 funding cases)
- contractual nature conservation (2022: 31,058 funding cases, indicator: 396,312 ha grant-aided area and 2023: 27,354 funding cases, indicator: 172,778 ha grant-aided area)
- cultivation of perennial wild plant mixtures (2023: 1,027 funding cases, indicator: 1,826 ha grant-aided area)
- particularly sustainable practices combined with the implementation of the Habitats Directive and Birds Directive / hardship compensation (2023: 913 funding cases, indicator: 13,183 ha grant-aided area)

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5.3.4. Federal Nature Conservation Fund

	2022	2023
Budget chapter and item:	1604 894 02	
Eligible expenditures:	€60.6 million	€92.2 million
GHG emission reduction:	Pursues other objectives	Pursues other objectives
Projects:	312	414
Newly approved projects:	38	121
Funding share:	Not available	Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	f)	c), f)
Assumptions and limitations: --		
Links: https://www.bfn.de/hintergrund-bundesnaturschutzfonds		

During the current legislative period, the federal government is consolidating and expanding its project funding for nature conservation and landscape management. The aim is to more effectively implement approaches that directly or indirectly strengthen biodiversity. The new Federal Nature Conservation Fund (*Bundesnaturschutzfonds*) was established in 2022 for this purpose and bundles the following existing funding programmes: the Federal Biological Diversity Programme (*Bundesprogramm Biologische Vielfalt*), the Floodplain Funding Programme (*Auenprogramm*) under the federal programme Blue Ribbon Germany (*Blaues Band Deutschland*), chance.natur (large-scale nature conservation projects), Project Funding for Testing and Development (*Projektförderung Erprobung und Entwicklung*), and the Wilderness Fund (*Wildnisfonds*). The National Species Recovery Programme (*Nationales Artenhilfsprogramm*) was added in 2022.

Funding programme	Brief description	Eligible expenditures (in € million) 2022	2023	Impact indicators
National Species Recovery Programme	The National Species Recovery Programme (*Nationales Artenhilfsprogramm*) funds projects aimed at permanently protecting species and their habitats and improving their conservation status. The funding programme is focused on protecting species affected by the expansion of renewable energies.	0	1.6	Project profiles for all funded projects are available at https://www.bfn.de/projektsteckbriefe?f%5B0%5D=project_type%3A891 Number of funded projects: 2022: 4 newly approved projects 2023: 16 (12 new)

Funding programme	Brief description	Eligible expenditures (in € million)		Impact indicators
		2022	2023	
Federal Biological Diversity Programme	The federal programme supports projects in five priority areas that are of national significance within the framework of the National Biodiversity Strategy or that implement this strategy in a particularly exemplary and standard-setting way: --> German national responsibility species --> Biodiversity hotspots in Germany --> Safeguarding ecosystem services --> Urban nature --> Additional measures of particular significance for the Strategy	38.8	50.1	Project profiles for all funded projects are available at https://www.bfn.de/projektsteckbriefe?f%5B0%5D=project_type%3A377 Number of funded projects: 2022: 251 (of which 30 are newly approved and 221 ongoing) 2023: 333 (of which 98 are newly approved and 235 ongoing)
Federal programme “Blue Ribbon Germany”	The Federal Ministry for Digital and Transport and the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection support the renaturation of federal waterways and their floodplains through the “Blue Ribbon Germany” programme. The Federal Ministry for Digital and Transport funds projects under the Floodplain Funding Programme (*Förderprogramm Auen*). The aim is to improve the condition of floodplains along 20% of federal waterways by at least one “grade” by 2050. In addition, infrastructure along federal waterways that is no longer needed is to be dismantled or converted to a near-natural state in combination with renaturation measures.	1.6	3.2	Overview of funded areas: https://www.bfn.de/daten-und-fakten/kulisse-des-bundesprogramms-blaues-band-deutschland Number of funded projects (regular implementation, preliminary assessment and “other” counted as individual projects respectively): 2022: 5 projects (of which 1 is newly approved) 2023: 11 projects (of which 5 are newly approved)
Testing and development projects	Testing and development projects serve as models by putting innovative nature conservation approaches and measures into practice. Projects that combine aspects of conservation and utilisation are especially important. The following areas are funded:	3.1	2.8	Overview of funded projects: https://www.bfn.de/daten-und-fakten/erprobungs-und-entwicklungsvorhaben-des-bundes-im-bereich-naturschutz-und Number of funded projects (preliminary assessment,

Funding programme	Brief description	Eligible expenditures (in € million) 2022	2023	Impact indicators
	--> Implementation of important research results in practice. --> Testing new and improved applications of already tested methods. --> Turning the insights gained (successes and failures) into recommendations that can be used widely in practice.			main project and scientific monitoring counted as individual projects respectively): 2022: 30 projects (of which 5 are newly approved) 2023: 28 projects (of which 4 are newly approved)
Large-scale nature conservation projects (chance.natur)	"chance.natur" supports projects in areas that are of particular value to nature conservation both nationally and internationally and that are particularly characteristic and representative of the habitat type in question in Germany. The aim of the funding programme is to contribute to the long-term preservation of natural landscapes and to the protection and development of cultural landscapes with exceptional biotopes and animal and plant species in particular need of protection.	11.7	12.6	Information on all project areas and species found in these areas is available on the Federal Agency for Nature Conservation's website: https://www.bfn.de/projektsteckbriefe?f%5B0%5D=project_type%3A381 Number of funded projects: 2022: 19 projects (of which 2 are newly approved) 2023: 19 projects (of which 2 are newly approved)
Wilderness Fund	In order to achieve the 2% wilderness target set out in the National Biological Diversity Strategy (NBS), the federal government has established a Wilderness Fund, among other measures. Funding is available for projects that involve purchasing or exchanging a piece of land or that offer the owners of the land compensation for permanent relinquishment of use. The funding also covers ancillary costs and costs associated with securing the land for wilderness development.	5.4	21.9	https://www.z-u-g.org/wildnisfonds/projekte/ 2022: 3 projects, total area 206.6 ha 2023: 7 projects, 1,047 ha

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5.3.5. Measures for nature-based climate action

- Measures for natural climate protection
- Support measures for natural climate protection in rural local-authority areas

	2022	2023
Budget chapter and item:		6092 686 31 and 686 32
Eligible expenditures:		€14.0 million
GHG emission reduction:		Not available
Funding share:		Not available
EU environmental objectives under Article 9 of the Taxonomy Regulation:	a)	f)

Assumptions and limitations:
The comprehensive evaluation report on the Federal Action Plan on Nature-based Solutions for Climate and Biodiversity detailing the eligible expenditures for the funding approved to date will be published on the Federal Agency for Nature Conservation (BfN) website in the near future (before the end of 2025) but is not yet available at the time of publication of this Impact Report. It contains impact indicators for the eligible expenditures. Those will be reported for the first time in the 2025 Impact Report. In 2023 (issuance year 2024), preparatory work was largely carried out for the extensive funding starting in the following year.

Links:
https://www.kompetenzzentrum-nk.de/en/funding/
https://www.bfn.de/en

Nature-based climate action

Healthy ecosystems are a natural defence against climate change. Forests and floodplains, soils and peatlands, seas and water bodies, and urban and rural near-natural green spaces remove CO_2 from the atmosphere and store it for the long term. They also act as buffers against the impacts of climate change, by absorbing heavy rainfall and floodwaters and providing cooling during hot weather. At the same time, they sustain the foundations of life, provide important habitats for plants and animals, store water and provide people with places for respite and recreation. Nature-based climate action combines climate action and nature conservation. In this way, it counteracts the twin environmental crises of global warming and species extinction in a targeted way.

The Federal Action Plan on Nature-based Solutions for Climate and Biodiversity (*Aktionsprogramm Natürlicher Klimaschutz der Bundesregierung*) contains measures that combine climate action with the creation and strengthening of healthy ecosystems in order to improve the overall state of ecosystems in Germany and make them more resilient. It consists of 69 measures divided among ten fields of action.

The measures taken into account as eligible expenditures for Green German Federal securities will be financed in 2023 from the following budget items:

Measures for nature-based climate action (6092 686 31)

The Federal Action Plan on Nature-based Solutions for Climate and Biodiversity is the programme underpinning the various funding measures under this budget item. Since the Action Plan was adopted in March 2023, a range of funding measures have been developed in the following fields of action: settlement areas, water bodies, forests, peatlands, seas and coasts, and soils. Many have already started and others will be established by the end of 2024. In addition to

these, the Action Plan is also funding other important measures. These encompass reviewing legal frameworks, consultation and educational services, innovative research projects, the establishment of structures and comprehensive monitoring.

Funding measure for nature-based climate action in rural local-authority areas (6092 686 32)

The "funding guidelines for nature-based climate action in rural local-authority areas" is one of the many measures of the Federal Action Plan on Nature-based Solutions (Action Plan measure 7.12). The measure supports local authorities so that large areas of publicly owned land can contribute to climate-change mitigation and the preservation or enhancement of biodiversity, thereby also improving the quality of life in rural districts, cities and communities. The aim is for areas owned by local authorities to be greened and ecologically upgraded. These include spaces in or on the outskirts of towns or villages, along rivers and lakes and on moorlands. This involves desealing measures to restore permeability, as well as floodplain restoration, tree planting and much more.[56]

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[56] www.kfw.de/inlandsfoerderung/%C3%96ffentliche-Einrichtungen/St%C3%A4dte-und-Gemeinden-gestalten/F%C3%B6rderprodukte/Nat%C3%BCrlicher-Klimaschutz-in-Kommunen-(444)/

5.4. Coastal and flood protection

5.4.1. Grants to fund flood protection facilities, the renaturation of dykes, torrent control and the renaturation of water bodies

	2022	2023
Budget chapter and item:	Annex 1 to 1003 (1095) 882 15	
Eligible expenditures:	€76.3 million	€69.6 million
GHG emission reduction:	Pursues other objectives	Pursues other objectives
Funding cases:	947	842
Grant-aided area:	34,657 ha	9,169 ha
Grant-aided area within the framework of water body renaturation:	1,288 km/3,114 ha	1,201 km/3,914 ha
Funding share:	60%	60%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	b)	c) f)

Assumptions and limitations: GAK reporting by the *Länder*, reporting period 2022 and 2023
The indicators relate to a funding share of 100% (federal funds, *Länder* funds, EU funds and other public funds in accordance with the report).

Links: https://www.bmleh.de/EN/topics/rural-regions/rural-development-support/gak.html
https://www.bmel-statistik.de/fileadmin/daten/0002000-2022.pdf
https://www.bmel-statistik.de/fileadmin/daten/4500101-2022.pdf
https://www.bmel-statistik.de/fileadmin/daten/0002000-2023.pdf
https://www.bmel-statistik.de/fileadmin/daten/4500101-2023.pdf

For general information on the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK), see section 5.2.2 “Forestry measures”. The above funding was used in 2022 and 2023 to support both flood protection measures and the renaturation of water bodies by the *Länder* (60:40 federal government/*Länder* funding split):

- Construction and reinforcement of flood defences and torrent regulation works (2022: 464 funding cases; indicator: 34,657 ha protected area and 2023: 462 funding cases; indicator: 9,169 ha protected area)
- Relocation and dismantling of dykes (2022: 54 funding cases and 2023: 1 funding case)
- Measures for the renaturation of water bodies aim to help improve the ecological and chemical status of surface waters in rural areas This includes the creation of areas for the renaturation of water bodies and the improvement of water retention in the landscape. 2022: 429 funding cases; indicator: 1,288 km/3,114 ha grant-aided area and 2023: 379 funding cases; indicator: 1,201 km/3914 ha grant-aided area).

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5.4.2. Grants to fund coastal protection measures

- Grants to fund coastal protection measures
- Grants to fund coastal protection measures to counter the effects of climate change

	2022	2023
Budget chapter and item:	Annex 1 to 1003(1095) 882 61 and 882 81	
Eligible expenditures:	€96.4 million	€85.2 million
GHG emission reduction:	Pursues other objectives	Pursues other objectives
Funding cases:	196	340
Grant-aided area:	20,000 ha	398,700 ha
Funding share:	70%	70%
EU environmental objectives under Article 9 of the Taxonomy Regulation:		

Assumptions and limitations: GAK reporting by the *Länder*, reporting period 2022 and 2023
The indicators relate to a funding share of 100% (federal funds, *Länder* funds, EU funds and other public funds in accordance with the report).

Links: https://www.bmleh.de/EN/topics/rural-regions/rural-development-support/gak.html
https://www.bmel-statistik.de/fileadmin/daten/0002000-2022.pdf
https://www.bmel-statistik.de/fileadmin/daten/6500100-2022.pdf
https://www.bmel-statistik.de/fileadmin/daten/4500301-2022.pdf
https://www.bmel-statistik.de/fileadmin/daten/0002000-2023.pdf
https://www.bmel-statistik.de/fileadmin/daten/6500100-2023.pdf
https://www.bmel-statistik.de/fileadmin/daten/4500301-2023.pdf

For general information on the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK), see section 5.2.2 “Forestry measures”.

A wide variety of precautions are taken to protect coastlines from excessive wind and wave erosion. They include dykes, breakwaters, groynes, barrages, sluices, pumping stations, seawalls, sand replenishment and dune vegetation planting. The most effective measures in a particular case depend on local conditions, the current and surf conditions and the coastal topography (low-lying or steep coast).

Planning, implementing and maintaining coastal defences is the responsibility of the *Länder*. Each of the German coastal *Länder* sets out its coastal protection strategy in a general coastal protection plan (*Generalplan Küstenschutz*), which is regularly updated.

Due to the major importance of coastal protection, the federal government has contributed 70% of the costs of coastal protection measures carried out since 1973.

The funding was used in 2022 and 2023 for various safety measures on Germany’s coastlines, islands and flowing surface waters in tidal areas to protect against flooding and land loss due to storm surges and coastal floods (70:30 federal government/*Länder* funding split). The measures are implemented by the coastal *Länder*.

The following measures were supported, to which the above indicators relate:

- Construction and reinforcement of flood defences, including dyke defence paths and debris clearing tracks (2022: 93 funding cases and 2023: 184 funding cases)
- Barrages and other structures in the flood protection line (2022: 6 funding cases and 2023: 31 funding cases)
- Groynes, breakwaters and other installations in the sea (2022: 3 funding cases and 2023: 5 funding cases)
- Foreshore works in front of seawalls up to a depth of 400m (2022: 1 funding case and 2023: 6 funding cases)
- Sand replenishment (2022: 17 funding cases and 2023: 21 funding cases)
- Bank protection works (2022: 1 funding case and 2023: 4 funding cases)

Due to climate change, sea levels are rising more rapidly than previously predicted. This must be taken into account when dimensioning coastal protection structures.

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Planned or new coastal protection measures must be implemented more quickly. To meet the additional funding requirements for these priority measures, additional funding is being made available through the **GAK special framework plan "Coastal Protection Measures in Response to Climate Change" (*Maßnahmen des Küstenschutzes in Folge des Klimawandels*)**.

In 2022 and 2023, the above funding was used to support the following coastal protection measures, to which the above indicators relate:

- Construction and reinforcement of flood defences, including dyke defence paths and debris clearing tracks (2022: 74 funding cases and 2023: 88 funding cases)
- barrages and other structures in the flood protection line (2023: 1 funding case)
- sand replenishment (2022: 1 funding case)

5.4.3. Federal share of funding for the special framework programme for preventative flood protection measures

	2022	2023
Budget chapter and item:	Annex 1 to 1003(1095) 882 82	
Eligible expenditures:	€54.4 million	€58.8 million
GHG emission reduction:	Pursues other objectives	Pursues other objectives
Reclaimed floodplain area from the removal of dykes:	2,105 ha	2,855 ha
Retention area gained from retention measures:	282 m^3	246 m^3
Funding share:	60%	60%
EU environmental objectives under Article 9 of the Taxonomy Regulation:	b)	

Assumptions and limitations: GAK reporting by the *Länder*, reporting period 2022 and 2023
The indicators relate to a funding share of 100% (federal funds, *Länder* funds, EU funds and other public funds in accordance with the report).

Links: https://www.bmleh.de/EN/topics/rural-regions/rural-development-support/gak.html
https://www.bmel-statistik.de/fileadmin/daten/0002000-2022.pdf
https://www.bmel-statistik.de/fileadmin/daten/4500201-2022.pdf
https://www.bmel-statistik.de/fileadmin/daten/0002000-2023.pdf
https://www.bmel-statistik.de/fileadmin/daten/4500201-2023.pdf

For general information on the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (GAK), see section 5.2.2 “Forestry measures”.

In order to increase support for urgent preventive flood protection measures, additional funding for investments is made available to the *Länder* under the GAK special framework plan “Measures for Preventive Flood Protection” (*Maßnahmen des präventiven Hochwasserschutzes*). Rivers regain more space through the relocation of dykes. Other preventive flood protection measures include the construction of flood retention basins and flood retention polders.

The above funding was used to provide additional support for numerous urgent investment measures for preventive flood protection in 2022 in 2023. These include the following measures, to which the above indicators relate:

- the removal of dykes to improve flood protection, in particular to reclaim floodplains
- measures to gain retention areas, such as the creation of flood retention basins and polders

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III. Methodology

Explanatory notes are provided in the following on the methodology for budget items with GHG estimates at budget item level. The methodology varies according to budget item, programme and project duration, ranging from ex-ante estimates and modelling to ex-post evaluation. For this reason, the figures are only aggregated (e.g. to provide an overview of significant contributions) to the extent that the estimation approaches allow.

Budget items	Eligible expenditures (in € million) 2022	2023	Methodology
1.1.1 Construction cost subsidies for investments in the expansion of the federal rail infrastructure	1,790.0	1,902.0	For projects under the Federal Transport Infrastructure Plan 2030, ex-ante estimates were made of the change in life cycle emissions, meaning greenhouse gas emissions from the operation of rolling stock and from the construction, maintenance and repair of infrastructure. The annual GHG emission reduction represents the annual GHG reduction share from route opening.
1.1.5 Reduction of infrastructure facility charges in rail freight transport	37.1	84.3	The 2024 evaluation (for the 2021-2023 evaluation period) found that CO_2e emissions had been reduced by 379,400 tonnes, with eligible expenditures totalling €197.5 million. The share of annual expenditure in the total emission reduction is determined proportionally based on total expenditure.
1.1.6 Reduction of track access charges in rail freight transport	380.4	374.2	Model calculations from the evaluation carried out in 2021 for the previous funding period (1 July 2018 to 31 December 2020). The impacts for 2022 and 2023 are approximated based on the ratio of funding provided in 2022 and 2023 (respectively) to the funding provided during the funding period covered by the evaluation.
1.1.8 Subsidies to private companies for investments in combined transport	43.8	65.3	Report on the evaluation of the "Guidelines on the promotion of transshipment facilities for combined transport by non-federally owned companies". The relief effect of 40.95 tkm per euro of funding used, on which the calculation is based, is an average figure calculated from the relief effect due to the additional transshipment volume of all CT terminals funded in the period 1998-2019. Applied to 2022 and 2023 funding volumes and transport performance converted to GHG reduction.
1.1.9 Investment subsidies to private companies to fund the construction, expansion, reactivation and replacement of sidings and other rail freight facilities	20.5	11.5	The calculation is based on a 2019 evaluation of the sidings funding guidelines over the evaluation period August 2004 (when the funding was introduced) to September 2019 (the assessment cut-off date) and an evaluation scope of 125 projects (funded sidings) with a funding volume of €91.7 million. In terms of rail transport performance, new and additional traffic totalling 38,900 million tkm was generated in the evaluation period. This means an average of 424 million tkm transport performance was shifted to rail or additionally generated for each €1 million in funding. Likewise in 2019, on the basis of the TREMOD project, the Federal Environment Agency published a comparison of greenhouse gas emissions from the various modes of

Budget items	Eligible expenditures (in € million) 2022	2023	Methodology
			freight transport. This showed that rail freight can reduce greenhouse gas emissions by an average of 84 g/tkm compared to road freight. Based on the 424 million tkm transport performance generated in the above evaluation period, this corresponds to a total reduction in CO2e emissions of 35,600 tonnes per €1 million in funding.
1.2.3 Measures for the expansion of electric mobility	256.9	328.9	The reduction in GHG emissions cited above was derived from the research accompanying the "Elektro-Mobil" programme and refers solely to the programme's charging infrastructure module. The reduction of approximately one million t CO_2e covers the entire lifespan of the charging infrastructure funded from that year's eligible expenditures.
1.2.4 Grants for the purchase of commercial vehicles with alternative, climate-friendly engines; subsidies for the construction of filling and charging infrastructure	63.6	152.9	The data on GHG emission reduction in 2023 refers solely to commercial and special vehicles funded through budget item 6092 893 08 with eligible expenditures of €31.6 million and is the total reduction over the lifetime of the vehicles. In 2022, GHG emission reduction could not be calculated due to a lack of operational data at that time.
1.2.5 Promotion of purchases of buses with alternative drives	116.6	114.9	Data on funded vehicles and environmental impacts refers to the electric buses that went into operation in the respective calendar year and their expected 12-year lifespan. Impact indicators for annual eligible expenditures are determined as follows: the number of e-buses entering service in a given year (expressed as a percentage of the total number of e-buses entering service (1,489)) is calculated, and this percentage is then applied to the total impacts calculated as part of the accompanying research.
1.4.2 Grants and subsidies in the area of cycling	20.5	42.8	The BMDV received scientific advice and guidance for the purposes of fine-tuning its Mobility and Fuels Strategy. This included a study estimating the climate impacts of cycling infrastructure measures. Specifically, this study conducted an ex-ante impact assessment (not an evaluation) of (a) the shift to cycling as a mode of transport and (b) the (resulting) climate impacts (potential GHG reduction) attributable to BMDV financial assistance and funding programmes. The pro rata amount of GHG savings for each reporting year (only referring to budget items 1210 891 91 and 1210 891 92) was calculated on the basis of the ratio between (a) actually disbursed funds during the respective reporting year and (b) total funding for the respective programme (this was the basis for calculating the estimated GHG reduction potential). The data provided here represents the cumulative amount of GHG savings to 2045 that the funding disbursed in the respective year is expected to achieve.

Budget items	Eligible expenditures (in € million) 2022	2023	Methodology
1.4.3 Financial assistance to the *Länder* for the Cities and Rural Areas (*Stadt und Land*) programme for investments in cycling	119.9	269.2	The BMDV received scientific advice and guidance for the purposes of fine-tuning its Mobility and Fuels Strategy. This included a study estimating the climate impacts of cycling infrastructure measures. Specifically, this study conducted an ex-ante impact assessment (not an evaluation) of (a) the shift to cycling as a mode of transport and (b) the (resulting) climate impacts (potential GHG reduction) attributable to BMDV financial assistance and funding programmes. The pro rata amount of GHG savings for each reporting year was calculated on the basis of the ratio between (a) actually disbursed funds during the respective reporting year and (b) total funding for the respective programme (this was the basis for calculating the estimated GHG reduction potential). The data provided here represents the cumulative amount of GHG savings to 2045 that the funding disbursed in the respective year is expected to achieve.
2.3.2 Investments to protect the climate and biodiversity abroad	671.7	699.0	The GHG reduction figures refer exclusively to mitigation effects obtained during the project period (ex-post). They do not include projected savings generated by, for example, the ongoing use of new technologies. They do not refer to a specific year (except for the number of funded projects) but rather to the cumulative impacts achieved during the elapsed duration of the respective multi-year project (here, including the reporting years 2022 and 2023, respectively). Projects that have achieved plausible GHG reduction effects account for a small part of the International Climate Initiative's portfolio.
2.5.1 Entering markets abroad	16.8	16.0	The GHG emission reduction relates exclusively to the Renewable Energy Solutions (RES) programme with eligible expenditures of €2.687 million in 2022 and €1.444 million in 2023. The entire GHG reduction relates to reduction effects obtained during the project period (ex-post). It does not include projected savings generated by, for example, the ongoing use of renewable energy sources.
3.4.1 Technology transfer – lightweighting	52.7	80.2	It is only possible to estimate potential GHG reductions, which must be regarded with considerable caution given the R&D character of the projects and the related uncertainty concerning the implementation of market-relevant products. On a conservative estimate, it is assumed that only 10% of the projects will be commercialised. Data on potential GHG reductions from the projects is requested at various points in time in an accompanying monitoring programme. The stated potential reductions are based on data requested at an early stage of the projects. The projects report on potential reductions for products and materials in the production, use and end-of-life phases. To obtain comparable data, the figures are requested at a short-to medium-term interval after completion of the R&D

Budget items	Eligible expenditures (in € million)		Methodology
	2022	2023	
			projects. A summary analysis is applied for this purpose over a period of seven years after project completion.
4.2.2 Improving framework conditions for shore-to-ship power supply in German ports	12.4	31.5	Annual GHG reductions are reported for 2022 for three and 2023 for eleven completed systems.
4.2.3 Funding to promote energy efficiency and renewable energy measures in the buildings sector	1,338.8	339.1	The GHG reduction figure relates to the lifetime of the systems for which funding was paid out in 2022 and 2023. The timing of implementation may vary from this. For a detailed description of the assumptions/methodology, please refer to the evaluation report. Please refer to the evaluations of the CO2 building rehabilitation programme and the market incentive programme. The GHG reduction is determined by extrapolating from the funding efficiency of the MAP in 2021.
4.3.2 Energy efficiency in industry and businesses	278.7	449.4	It should be noted that the savings identified in the evaluation report relate to the approved funding volume. The savings are therefore converted on the basis of the funding efficiencies identified in the evaluation report for GHG savings or end-use energy savings for the applicable eligible expenditures. The stated annual GHG savings and end-use energy savings apply from 2022/2023 for an eight-year lifetime.
4.3.3 Providing advice on energy efficiency	166.3	232.3	Evaluation of energy advice to private consumers, for residential buildings, non-residential buildings, installations and systems. The average reductions identified in the evaluations for each consulting format are multiplied by the annual case numbers in the various programmes.
4.4.1 National Climate Initiative and national climate action measures	218.8	298.5	The GHG emission reductions for 2022 and 2023 are estimated based on the eligible expenditures in the individual programmes of the National Climate Initiative and the net figures for the funding efficiency from the 2020/2021 evaluation report.
5.1.4 Subsidies to fund measures for improving energy efficiency in agriculture and horticulture (including investments)	10.3	17.7	The data on GHG reductions and number of beneficiaries refer to the projects for which funding was paid out in 2022 and 2023, some of which began to be implemented a year before. The sum total of GHG emission reductions is based on expert appraisals for each individual project and relates to the investment projects.

IV. Acknowledgements

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- Federal Ministry for Economic Affairs and Climate Action (BMWK)
- Federal Ministry of Food and Agriculture (BMEL)
- Federal Ministry for Digital and Transport (BMDV)
- Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV)
- Federal Ministry of Education and Research (BMBF)
- Federal Ministry for Economic Cooperation and Development (BMZ)
- Federal Ministry for Housing, Urban Development and Building (BMWSB)

The names and responsibilities of the ministries correspond to the 2022 and 2023 fiscal years.[57]

Furthermore, thanks are due to the many project partners, authorities and funding agencies that implement the funding programmes and hence contribute significantly to impact reporting.

[57] Official order of the ministries in accordance with Annex 2 of the announcement of the formation of the government on 8 December 2021 in the Federal Gazette of 10 December 2021 (https://www.bundesanzeiger.de/pub/de/amtlicher-teil?19&year=2021&edition=BAnz+AT+10.12.2021).

V. Glossary

ABS	rail upgrade
AI	artificial intelligence
BAFA	Federal Office for Economics and Export Control
bn	billion
BÖL	Federal Organic Farming Scheme
CFCs	chlorofluorocarbons
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents for all greenhouse gases
CT	combined transport
DLR	German Aerospace Center
GAK	Joint Task for the Improvement of Agricultural Structures and Coastal Protection
GCF	Green Climate Fund
GHG	greenhouse gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
H_2	hydrogen
ha	hectare
IZB	Infrastructure Status and Development Report
km	kilometre
LuFo	aviation research programme
LULUCF	land use, land-use change and forestry
MSMEs	micro, small and medium-sized enterprises
MW	megawatt
MWh	megawatt-hour
NBS	new rail line
NDCs	nationally determined contributions (Paris agreement)
NO_x	nitrogen oxides
p.a.	per annum
PM	particulate matter
R&D	research and development
SDGs	UN sustainable development goals
SMEs	small and medium-sized enterprises
t	tonne
TC	technical cooperation
tkm	tonne-kilometre
USD	US dollars

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