Federal Ministry
of Finance

Green bond impact report

2020

Green bond impact report

2020

September 2022

Contents

I. Overview

This impact report relates to the Green German Federal securities issued in 2020. The report first provides a summary of the main impacts before going on to look at each budget item individually (Chapter II).

Green German Federal securities with a volume of €11.5 billion were issued in 2020 (see following table). The equivalent amount of this issuance volume was allocated to the expenditures identified as green (hereinafter: eligible) in 2019 in the Green bond allocation report[1]. The proceeds of the 2020 issuances of Green German Federal securities were fully allocated. This impact report therefore concludes the reporting for the 2020 issuances in accordance with the Green Bond Framework.[2]

The Core Green Bond Team consisting of the Federal Ministry of Finance (BMF) (Chair), the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and the Federal Republic of Germany – Finance Agency identified eligible expenditures of around €12.3 billion from 65 items in the 2019 federal budget. The auditing firm Deloitte conducted an external audit of the allocation and confirmed the allocation of the issuance proceeds to the eligible expenditures ("third-party verification").

Green German Federal securities 2020

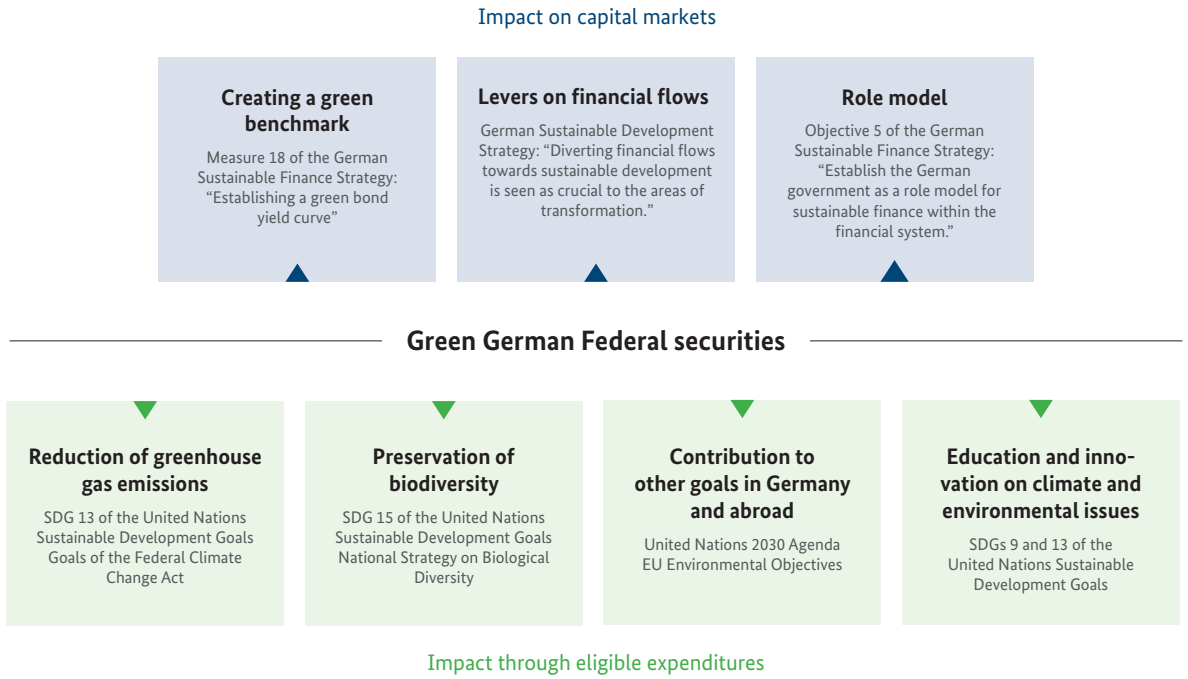
Issuance date	Type of issue	Issuance procedure	Type of security	Maturity date	Coupon	ISIN	Issuance volume
02.09.2020	New issue	Syndicate	10-year Green Federal Bond ("Green Bund")	15.08.2030	0%	DE0001030708	€6.5bn
04.11.2020	New issue	Auction	5-year Green Federal Note ("Green Bobl")	10.10.2025	0%	DE0001030716	€5.0bn

Green German Federal securities unfold their impact in different and multi-faceted ways both directly on the capital markets, and indirectly via the underlying expenditures at national and international level.

1 Allocation Report for Green German Federal securities 2020 of 20 April 2021: Green bond allocation report 2020 https://www.deutsche-finanzagentur.de/fileadmin/user_upload/Institutionelle-investoren/green/reports/GreenBondAllocationReport_2020_en.pdf

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

Figure 1: Goals and impacts of Green German Federal securities



Source: Federal Ministry of Finance

Capital markets

On the capital markets, Green German Federal securities directly transfer Germany's established market approach to the green segment, offering a reliable green investment with maximum price transparency. Combined with the aim of creating and maintaining a liquid green Bund market with a diversified maturity spectrum for different types of investors, this will attract new investors and new issuers to the green bond market. This is expected to accelerate the development of sustainable capital markets overall and serve as a catalyst to channel more public and private investment into a greener economy.

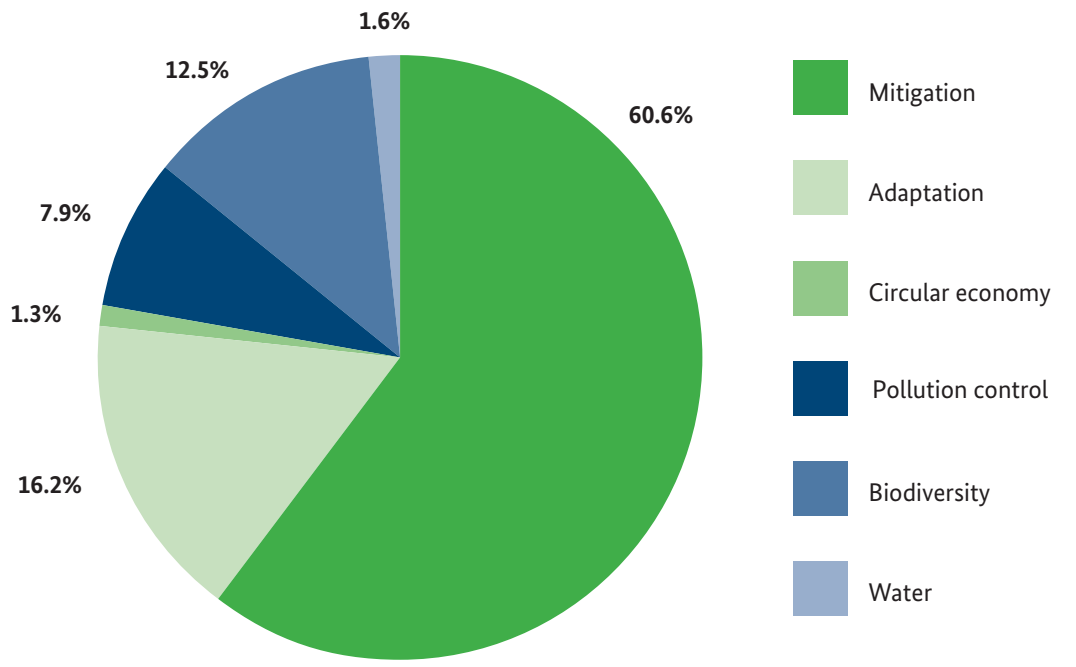
With the firm intention of establishing a green Bund curve, the Federal Republic of Germany is signalling that it will issue Green German Federal securities on a permanent and long-term basis. This is based on the eligible expenditures of the federal budget (including the Energy and Climate Fund[3]), through which Green German Federal securities achieve their indirect effect.

EU environmental objectives

In accordance with the 2020 Green bond allocation report, the eligible expenditures in 2019 are distributed among the environmental objectives of the EU taxonomy for environmentally sustainable economic activities as follows:

3 With the entry into force of the Second Act Amending the Act Establishing a Special Fund "Energy and Climate Fund" on 22 July 2022, the designation of the Special Fund was changed to "Climate and Transformation Fund" (cf. Federal Law Gazette 2022 part I no. 26 of 21 July 2022). For the purposes of the impact report 2020, the designation of the financial year 2019 will be used.

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



Source: Green bond allocation report 2020

National commitment

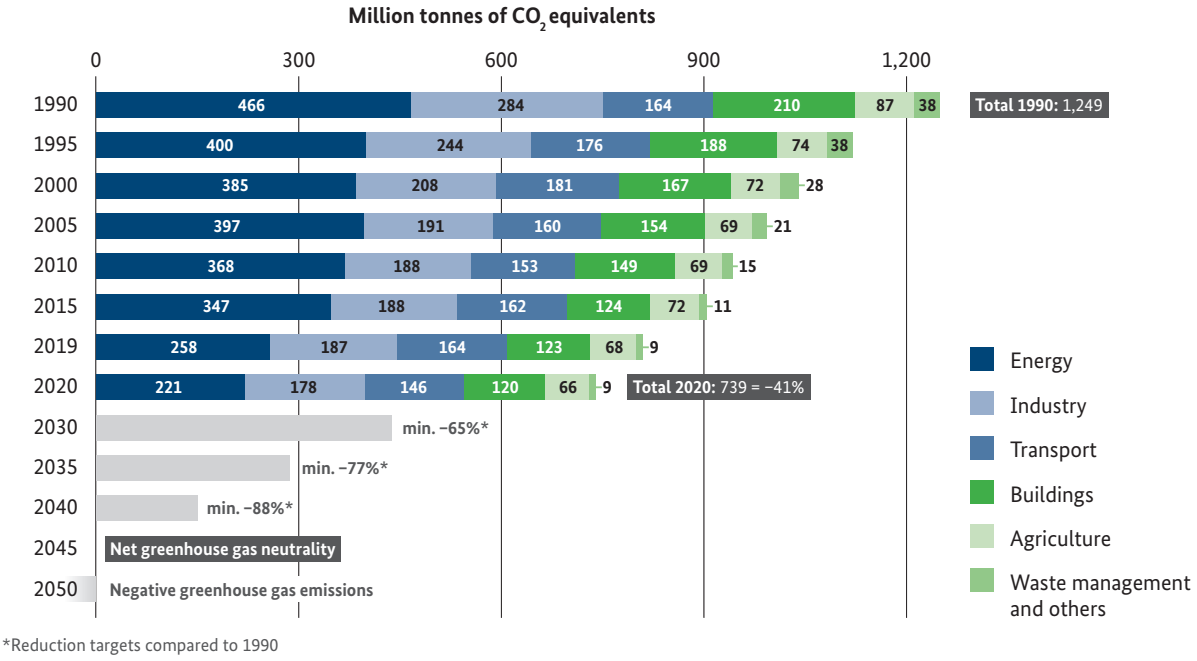
Germany is committed to the Paris Agreement and the 17 United Nations Sustainable Development Goals (SDGs). Its goal of becoming greenhouse gas neutral by 2045 was enshrined in the amended Federal Climate Change Act[4] in 2021. Moreover, binding interim targets and annually decreasing emission levels up to and including 2030 were set for the individual emission sectors:

- Energy
- Industry
- Buildings
- Transport
- Agriculture
- Waste management and others

In 2020, greenhouse gas emissions were reduced by about 70 million tonnes of CO_2 equivalents compared to the previous year. This significant reduction is partly due to pandemic-related effects. Compared to 1990, the reduction amounted to a 41% reduction in greenhouse gas emissions. The reduction targets are 65% for 2030, and 88% for 2040.

4 https://www.bmu.de/themen/klimaschutz-anpassung/klimaschutz/bundes-klimaschutzgesetz

Figure 3: Greenhouse gas emissions since 1990 according to the Climate Action Report 2021



*Reduction targets compared to 1990

Source: Climate Action Report 2021

These goals are to be achieved through numerous 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 on under the German Council Presidency at the end of 2020. Other goals in the transition to a sustainable economy include switching to renewable energies, using energy more efficiently, adapting to climate change and preserving biodiversity.

International cooperation

Germany plays a key role in international cooperation for sustainable development. In this way, Germany supports developing countries and emerging economies in their transition to more ecologically 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 change, the environment, nature, biodiversity and sustainable resource use.

Significant contributions of eligible expenditures

The Federal Republic of Germany's Green Bond Framework[5] dated 24 August 2020 contains possible expenditure categories that contribute to environmental protection, nature conservation and climate action and can be assigned to Green German Federal securities. They are divided among five central thematic fields (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 delivers a final conclusion on the impact of the 2019 eligible expenditures of €12.3 billion on the environment and climate, broken down by these sectors. The following is an initial summary of the manifold impacts of the broad and very diversified expenditure portfolio, aggregated only when the different calculation approaches allow.

Contributions to the reduction of greenhouse gas emissions

more than 1.5 million t CO_2-e p.a. (co-financing)

In the transport sector, eligible expenditures of around €1.7 billion were used for new construction and expansion projects in the rail and waterways sectors. The new rail construction and expansion projects of the Federal Transport Infrastructure Plan 2030, which are being co-financed by this amount, will contribute to an annual reduction in emissions of around 1.2 million tonnes of CO_2 equivalents from the time the routes are opened. Together with the investments in the federal waterways, a reduction of more than 1.5 million tonnes of CO_2 equivalents per year is calculated for the transport sector after completion of the measures.

more than 1.0 million t CO_2-e in 2019

The pro rata subsidy for track access charges provides incentives to safeguard existing rail freight transport and to shift transport to the railways. Without the subsidy, more than 0.9 million tonnes of CO_2 equivalents would have been emitted in 2019. In addition, the funding of combined transport reduced emissions by around 0.1 million tonnes of CO_2 equivalents in 2019.

1.8 million t CO_2-e p.a.

In the energy and industry sector, an annual reduction in greenhouse gas (GHG) emissions of about 1.8 million tonnes of CO_2 equivalents can be attributed to the programmes to promote renewable energies and increase energy efficiency (eligible expenditures of €482 million).

more than 3.5 million t CO_2-e (project duration)

In addition, the measures of the National Climate Initiative (with expenditures of around €157 million) are contributing to CO_2 savings of more than 3.5 million tonnes of CO_2 equivalents over the entire impact period of the projects.

5 Green Bond Framework 2020 https://www.deutsche-finanzagentur.de/fileadmin/user_upload/Institutionelle-investoren/green/GreenBondFramework_2020_en.pdf

Renewal of tracks, switches, bridges

1,105km tracks, 1,417 switches, 289 bridges

In the transport sector (with eligible expenditures of around €7.1 billion the largest sector), about €6.2 billion was spent on the rail system. With investments in the existing network from federal funds amounting to €4.15 billion, a significant contribution was made to the maintenance of the rail network. Among other things, according to Deutsche Bahn AG (DB AG), 1,105km of track, 1,417 switches and 289 bridges were renewed.

Decarbonisation of the mobility sector

69,000 e-vehicles, etc.

Electromobility is a key instrument for decarbonising the mobility sector. With eligible expenditures of around €336 million, more than 69,000 e-vehicles, 2,897 charging devices and 840 research projects, among other things, were funded.

International support, especially for developing and emerging countries

approx. 2,000 projects

In the international cooperation sector, eligible expenditures of more than €2.9 billion financed or co-financed nearly 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

4,500 projects

The eligible expenditures of around €625 million in the research, innovation and awareness raising sector include more than 4,500 projects that enable and support education and innovation on climate and environmental issues.

Coastal and flood protection

1,374 funding cases

In the agriculture, forestry, natural landscapes and biodiversity sector, numerous funding opportunities for coastal and flood protection are being implemented by the *Länder*. The eligible expenditures of the federal budget (around €240 million), which are co-financed by the *Länder*, contribute to improving coastal and flood protection as well as near-natural watercourse development with 1,374 funding cases in 2019. In the area of coastal protection, the funds are being used, among other things, for the construction and reinforcement of flood protection structures and sand flushing; in the area of preventive flood protection, the funds are being used, among other things, for obtaining retention areas (e.g. flood retention basins).

II. Impact of eligible expenditures by budget item

The following section provides detailed reports for each of the 65 budget items used. 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 the type of expenditure, sector, relevance and (data) availability or 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.[6] The data was provided by the relevant federal ministries and is based on existing analyses and reports where possible. Special features of government expenditure categories, such as international cooperation grants or research and development projects, mean that the available impact indicators partly deviate from those commonly used on the market. They therefore include all impact dimensions (output, outcome and impact indicators). The German Sustainability Strategy stipulates that legislative projects must undergo sustainability impact assessments and that subsidies must be evaluated on a regular basis.[7] This will also expand the data basis of future impact reports of Green German Federal securities issuances in subsequent years.

The Core Green Bond Team coordinated the preparation of the report. The impact report was validated by the Interministerial Working Group. The report also drew on the expertise of the KfW as a member and coordinator of the Green Bond Principles working group “Impact Reporting”.

a) Tabular overview of the key indicators

The following tables provide an overview of the key eligible expenditure figures which are of particular importance for the sector or the budget item. The values given are rounded in accordance with standard commercial practice. Indicators, examples and detailed information such as assumptions and limitations can be found in the fact sheets for each budget item (part b) directly after the overview. For easy navigation, the names of the budget items in the table are linked to the corresponding fact sheets.

6 Handbook - Harmonised Framework for Impact Reporting. The Green Bond Principles. ICMA. June 2021. https://www.icmagroup.org/assets/documents/Sustainable-finance/2021-updates/Handbook-Harmonised-Framework-for-Impact-Reporting-June-2021-100621.pdf

7 In addition, the federal government is committed to the mandate in the coalition agreement: “Step by step, we will convert the federal budget (excluding personnel and administrative costs) to a target- and impact-oriented budget management, within the framework of which the political objectives of all funding and expenditure programmes will be translated into clearly defined, measurable indicators (e.g. SMART targets) already at the political decision-making stage and provided with fixed evaluation deadlines.”

Budget Chapter	Budget item	Name of the budget item	Eligible expenditures (in € million)	Allocated to Green Bund (in € million)	Allocated to Green Bobl (in € million)	Selected impact indicators
1. Sector Transport						
1.1. Rail transport						
1202	891 11	Subsidies towards construction costs for maintaining the federal rail infrastructure	4,150.0	2,190.9	1,685.3	Investment in the existing network: 1,105km tracks 1,417 switches 289 bridges
1202	891 01	Construction subsidies towards investments in the federal rail infrastructure	1,529.0	807.2	620.9	1.200 million t CO_2-e p.a. GHG reduction
1210	682 05	Reduction in track access charges for rail freight	340.0	179.5	138.1	0.932 million t CO_2-e avoided GHG emissions in 2019
1202	891 05	Measures to reduce noise pollution from existing federal railways	148.9	78.6	60.5	86km of noise-reduced route
1210	892 41	Subsidies to private companies for investing in combined transport	43.0	22.7	17.5	0.127 million t CO_2-e GHG reduction in2019
1.2. Alternative drive systems and fuels						
6092	683 04	Measures for the expansion of electric mobility, of which:	226.3	119.5	131.7	
		BMBF programmes	*75.0*	*39.6*	*30.4*	549 beneficiaries
		BMWi programmes	*60.0*	*31.7*	*24.4*	189 beneficiaries 627 charging stations installed
		BMU programmes	*54.2*	*28.6*	*22.0*	166 beneficiaries 5,665 subsidised e-vehicles
		BMVI programmes	*37.1*	*19.6*	*15.1*	332 beneficiaries 200 charging stations installed 1,622 subsidised e-vehicles 104 research projects
6092	893 01	Subsidies for the purchase of electric vehicles	98.0	51.8	39.8	61,724 subsidised e-vehicles
1210	892 03	National Hydrogen and Fuel Cell Technology Innovation Programme 2016 to 2026 (NIP)	60.5	32.0	24.6	178 subsidised H_2 vehicles

Budget Chapter	Budget item	Name of the budget item	Eligible expenditures (in € million)	Allocated to Green Bund (in € million)	Allocated to Green Bobl (in € million)	Selected impact indicators
6092	893 02	Subsidies for the construction of charging infrastructure for electric vehicles	11.6	6.1	4.7	2,070 charging stations installed
1.3. Public transport						
1206	882 02	Financial assistance to the *Länder* for regional and local public-transport rail infrastructure projects with eligible costs of more than €50 million each	104.0	54.9	42.2	24 projects
1206	891 01	Investment subsidies for regional and local public transport projects over €50m to Deutsche Bahn AG and companies majority-owned by the federal government	100.9	53.3	41.0	35 projects
1210	633 81	Local authority public pilot projects from 2018 to 2020 to complement the Immediate Action Programme for Clean Air	43.0	22.7	17.5	Reduction of NO_x, CO_2 and PM10 emissions
1.4. Waterways						
1203	780 02	Replacement, expansion and new construction projects relating to federal waterways	122.0	64.4	49.5	0.345 million t CO_2-e p.a. GHG reduction
1203	780 01	Maintenance of transport infrastructure	60.0	31.7	24.4	List of projects
1.5. Cycling						
1201	746 22	Construction of bike lanes including maintenance (federal highways)	85.0	44.9	34.5	159km of newly built and repaired cycle paths
1210	632 01 686 01 882 02 891 02	Implementation of the National Cycling Plan – 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 super-highways Subsidies for the implementation of the German Unity Cycle Route	3.1	1.6	1.2	List of projects and examples

Budget Chapter	Budget item	Name of the budget item	Eligible expenditures (in € million)	Allocated to Green Bund (in € million)	Allocated to Green Bobl (in € million)	Selected impact indicators
2. Sector International cooperation						
2.1. Bilateral financial cooperation						
2301	896 11	Bilateral financial cooperation – grants	658.5	347.6	267.4	428 projects
2301	896 01	Financial cooperation with regions	242.7	128.1	98.5	20 projects
2301	866 11	Bilateral financial cooperation – loans	198.8	105.0	80.7	70 projects
2.2. Bilateral technical cooperation						
2301	896 03	Bilateral technical cooperation	723.7	382.1	293.9	649 projects
2.3. International climate and environmental protection						
1602	896 05	Investments to protect the climate and biodiversity abroad	453.0	239.2	184.0	399 projects funded in 2019, of which 45 new projects from 2019
2310	687 01	International climate and environmental protection	88.0	46.5	35.7	146 projects
2.4. Multilateral cooperation						
2303	896 09	Developmentally important multilateral aid for global environmental protection, biodiversity conservation and climate protection	370.6	195.7	150.5	9 initiatives
1601	687 01	Membership fees to international organisations	22.3	11.8	9.0	27 organisations
2.5. Specific funding						
2310	896 31	Special Initiative ONE WORLD – No Hunger	184.0	97.1	74.7	27 projects
6092	687 02	International energy cooperation, commodity partnerships and technology cooperation	20.1	10.6	8.2	59 projects
1602	532 05	International cooperation	15.8	8.4	6.4	91 projects
1601	687 04	Export of green and sustainable (environmental) infrastructure	4.2	2.2	1.7	50 projects

Budget Chapter	Budget item	Name of the budget item	Eligible expenditures (in € million)	Allocated to Green Bund (in € million)	Allocated to Green Bobl (in € million)	Selected impact indicators
3. Sector Research, innovation and awareness rising						
3004	683 30	Bioeconomy	132.3	69.9	53.7	560 beneficiaries 1,372 projects
3004	685 41	Energy technologies and efficient use of energy – R&D projects	112.1	59.2	45.5	677 projects
3004	685 42	Environmental technologies and resources	108.8	57.4	44.2	1,635 beneficiaries
3004	685 40	Climate research, biodiversity and globalised habitats – R&D projects	91.6	48.3	37.2	486 beneficiaries 1,024 projects
3004	685 44	Coastal, marine and polar research, geoscience research – R&D projects	55.7	29.4	22.6	169 beneficiaries 345 projects
1601	544 01	Research, studies, etc.	50.1	26.4	20.3	170 newly committed projects in 2019 658 funded projects in 2019
3004	685 43	Social sciences for sustainability	33.5	17.7	13.6	284 beneficiaries 284 projects
1601	892 01	Investments to mitigate pollution (Environmental Innovation Programme pilot projects)	14.8	7.8	6.0	9 example projects with GHG savings of over 0.143 million t CO_2-e p.a. and further savings of materials, energy, water
1604	544 01	Research, studies, etc.	13.4	7.1	5.4	43 newly committed projects in 2019 211 funded projects in 2019
1601	685 04	Subsidies for organisations in the areas of environmental protection and nature conservation	10.1	5.3	4.1	5 examples
3004	683 10	Knowledge- and technology transfer tools as part of the High-Tech Strategy	2.8	1.5	1.1	26 beneficiaries 26 projects
4. Sector Energy and industry						
4.1. Energy research						
0903	683 01	Energy research	512.0	270.3	207.9	4,300 ongoing projects

Budget Chapter	Budget item	Name of the budget item	Eligible expenditures (in € million)	Allocated to Green Bund (in € million)	Allocated to Green Bobl (in € million)	Selected impact indicators
4.2. Renewable energy						
6092	686 04	Market Incentive Programme for the Use of Renewable Energy in the Heat Market	245.4	129.5	99.7	0.278 million t CO_2-e p.a. avoided GHG emissions (Impact reported together with 6092 686 11)
6092	686 13	Energy transition programmes and measures in the areas of renewable energy sources, electricity and power grids, digitalisation and energy infrastructure	47.3	25.0	19.2	199 beneficiaries
4.3. Energy efficiency						
6092	686 08	Energy efficiency in industry and businesses	133.2	70.3	54.1	1.0 million t CO_2-e p.a. avoided GHG emissions
6092	686 14	Providing advice on energy efficiency	54.3	28.7	22.0	0.507 million t CO_2-e p.a. avoided GHG emissions
6092	686 10	Heating optimisation programme	32.9	17.4	13.4	0.014 million t CO_2-e p.a. avoided GHG emissions
6092	686 11	Energy efficiency incentive programme	16.2	8.6	6.6	(Impact reported together with 6092 686 04)
4.4. National Climate Initiative						
6092	686 05	National Climate Initiative	119.6	63.2	48.6	3.57 million t CO_2-e over the entire impact period
1602	686 05	National Climate Initiative	37.5	19.8	15.2	
5. Sector Agriculture, forestry, natural landscapes and biodiversity						
5.1. Sustainable agriculture and forestry						
1005	686 31 893 31	Funding of innovation in the area of food, agriculture and health-related consumer protection	45.4	24.0	18.4	756 projects
1005	686 11 893 11	Subsidies to fund research, development and demonstration projects in the area of renewable resources and to fund national sustainable forestry projects	43.8	23.1	17.8	270 beneficiaries 559 projects
1003	632 41 882 41 632 42	Grants to fund forestry measures (excluding investments) Grants to fund forestry measures (investments)	28.4	15.0	11.5	32,376 funding cases 7,455ha reforested area *(within the framework of forest conversion of near-natural forest management)*

Budget Chapter	Budget item	Name of the budget item	Eligible expenditures (in € million)	Allocated to Green Bund (in € million)	Allocated to Green Bobl (in € million)	Selected impact indicators
	882 42	Grants to combat the consequences of extreme weather events in forests (excluding investments) Grants to combat the consequences of extreme weather events in forests (investments)				137ha of grant-aided area *(for the establishment of cultivation within the framework of initial afforestation (new planting of forest))* 3,483,854m³ of processed infested wood
6092	686 06	Forest Climate Fund	12.1	6.4	4.9	36 approved projects in 2019 152 ongoing projects in 2019
5.2. Coastal defences and flood protection						
1003	882 15	Grants to fund flood protection facilities, the renaturation of dykes, torrent control and the renaturation of water bodies	90.9	48.0	36.9	1,135 funding cases 341,652ha protected area 32ha retention area gained 1,979km/2,459ha Extent of support for near-natural watercourse development
1003	882 61	Grants for funding coastal defence measures	81.2	42.9	33.0	189 funding cases 17,546ha protected area
1003	882 82	Grants for funding preventive flood protection measures	50.4	26.6	20.5	15,979ha of reclaimed floodplain area 295,000,074m³ of reservoir space gained
1003	882 81	Grants to fund for coastal defence measures against the effects of climate change	18.2	9.6	7.4	50 funding cases 97,105ha protected area
5.3. Protection of ecosystems						
1604	882 01	Grants for the establishment and long-term protection of areas of nature and landscapes of national importance (chance.natur)	11.1	5.9	4.5	455,000ha project area 15 projects

Overview of impact indicators by sector and budget item

b) Fact sheets

The following individual data sheets provide detailed reports on the impact on the environment and climate for each budget item used. For easy navigation, there is a link to the tabular overview (part a) at the end of each fact sheet.

The central goal of the Federal Climate Change Act is to reduce greenhouse gas emissions. Where available, CO_2 reduction is therefore reported as a key indicator.[8] For the other goals in the transition to a sustainable economy, including the switch to renewable energy, more efficient use of energy, adaptation to climate change and preservation of biodiversity, available indicators are reported accordingly.

Current developments and forecasts of greenhouse gas emissions are published in the federal government's annual Climate Action Report.[9] According to the Climate Action Report 2021, greenhouse gas emissions in Germany fell by 8.7% in 2020 compared to the previous year, which corresponds to around 70 million tonnes of CO_2 equivalents.[10]

1. Transport

The transport sector is responsible for one fifth of Germany's greenhouse gas emissions, 98% of which result from road traffic.[11] The transport sector must therefore make a significant contribution if Germany is to achieve the climate targets it has set itself. In addition, the German government has set itself the goal of reducing air pollutants that are harmful to health and the environment, such as nitrogen oxides.[12] Accordingly, it has adopted extensive measures to decarbonise passenger and freight transport and make it more environmentally friendly.

According to the Climate Action Report 2021, greenhouse gas emissions in the transport sector fell by 11% in 2020 compared to the previous year, partly due to the coronavirus pandemic.[13]

The eligible expenditures of the sector in the amount of €7,125.3 million are distributed across 19 budget items in the categories of

- Rail transport (5 budget items with eligible expenditures of €6,210.9 million),
- Alternative drive systems and fuels (4 budget items with eligible expenditures of €396.4 million),
- Public transport (3 budget items with eligible expenditures of €247.9 million),
- Waterways (2 budget items with eligible expenditures of €182.0 million) and
- Cycling (5 budget items with eligible expenditures of €88.1 million).

8 For consistent reporting (paragraph 13 of the ICMA Green Bond Principles Harmonised Framework for Impact Reporting), reporting is uniformly in CO_2 equivalents. In accordance with the principle of prudence, CO_2 values were reported as CO_2 equivalents.

9 Pursuant to section 10 (1) of the Federal Climate Change Act, the federal government's Climate Action Report contains the development of greenhouse gas emissions in the various sectors, the status of implementation of the climate protection programmes and the emergency programmes, as well as a forecast of the expected greenhouse gas reduction effect. The Climate Action Report will be prepared annually by the federal government for the respective previous year.

10 For the impact report 2020, the data of the Climate Action Report 2021 are used. The Climate Action Report 2022 will be included in the impact report 2021. Detailed information on this can be found at https://www.bmuv.de/fileadmin/Daten_BMU/Download_PDF/Klimaschutz/klimaschutzbericht_2021_bf.pdf.

11 Climate Action Report 2021 of the federal government: https://www.bmuv.de/fileadmin/Daten_BMU/Download_PDF/Klimaschutz/klimaschutzbericht_2021_bf.pdf.

12 Cf. Federal Immission Control Act (BImSchG) and associated ordinance (BImSchV)

13 Cf. p. 15 Climate Action Report 2021

1.1. Rail transport

1.1.1. Subsidies towards construction costs for maintaining the federal rail infrastructure

Budget chapter and item	**1202 891 11**
Eligible expenditures 2019:	**€4,150.0 million**
GHG emission reduction:	**N/A**
Other indicators:	**Investment in the existing network:**
	1,150km tracks
	1,417 switches
	289 bridges
Funding share:	**N/A**
Assumptions and limitations: The impact data refer to the total amount invested (i.e. including grants for construction costs from third parties, other financing from the federal government, and own funding of DB AG).	
Links: Figures according to the Infrastructure Status and Development Report 2019, p. 33 - 35: https://www.eba.bund.de/SharedDocs/Downloads/DE/Finanzierung/IZB/IZB_2019.html	

Rail transport and infrastructure are of great importance in Germany for achieving climate protection goals. This includes, in particular, the shift of traffic from road to rail and the expansion of the electrification of driving systems and routes for decarbonisation. For this purpose, the federal government provides investment subsidies to maintain a high-quality rail infrastructure. Infrastructure deficiencies are eliminated and the performance of the rail network is increased.

The use of the spent expenditure is transparently set out in the annual Infrastructure Status Report (IZB). It contains quality indicators that provide information on the condition of the network. Explanations and further information:
https://www.eba.bund.de/DE/Themen/Finanzierung/LuFV/IZB/izb_node.html

Regarding the selected impact indicators, detailed information with investment examples are presented on the following pages in the IZB 2019: Tracks: P. 33-34; Switches: P. 34; Bridges: P. 35-36. In addition, the respective investment reports of DB Netz AG (P. 30ff), DB Station&Service AG (P. 143ff) and DB Energie GmbH (P. 228ff) included in the IZB present numerous other investment complexes in more detail.

Back to the overview

1.1.2. Construction subsidies towards investments in the federal rail infrastructure

Budget chapter and item:	**1202 891 01**
Eligible expenditures 2019:	**€1,529.0 million**
GHG emission reduction:	**1.200 million t CO_2-e p.a.**
Other indicators:	**--**
Funding share 2019:	**2.5%**
Assumptions and limitations: The annual GHG emission reduction represents the annual GHG reduction share from route opening. The actual CO_2 reduction is higher than indicated here. The recording of the CO_2 reduction was not part of the project assessment for the 2003 Federal Transport Infrastructure Plan (FTIP); this data was only recorded for projects in the 2030 FTIP, i.e. a CO_2 estimate is only available for some of the projects (cf. project list). The stated funding share of 2.5% was determined on the basis of the data in the Transport Investment Report 2019 (expenditures 2019 in relation to total investment sum of the projects for which GHG reduction is available)	
Links: https://www.bmvi.de/SharedDocs/DE/Artikel/G/BVWP/bundesverkehrswegeplan-2030-inhalte-herunterladen.html Methodology at: https://www.bmvi.de/SharedDocs/DE/Anlage/G/BVWP/bvwp-methodenhandbuch.pdf?__blob=publicationFile Project details at: https://www.bvwp-projekte.de/map_railroad_2018.html https://www.bmvi.de/SharedDocs/DE/Publikationen/G/verkehrsinvestitionsbericht-2019.html	

The federal government provides investment subsidies for the new construction and expansion of rail projects in the requirement plan for federal railways (Annex to § 1 of the Federal Railways Expansion Act). The 2030 Federal Transport Infrastructure Plan is the central element of infrastructure planning. Since the review of the FTIP in 2010, the CO_2- reduction has been recorded, although a CO_2 estimate is only available for the projects that have been reassessed since then. These projects are divided into projects under construction and projects in planning. Planning costs are part of the investment costs and are co-financed from this budget item. Further details of the projects can be found at: https://www.bvwp-projekte.de/map_railroad_2018.html.

Project	Reduction of GHG emissions (in t CO_2-e p.a.)
Projects under construction	
ABS Munich - Mühldorf - Freilassing	3,000
ABS Paderborn - Chemnitz 1st stage	2,143
ABS Uelzen - Stendal	6,857
ABS Ulm - Friedrichshafen - Lindau (Südbahn)	16,883
ABS/NBS Karlsruhe - Basel	148,429
ABS/NBS Stuttgart - Ulm - Augsburg	117,429
Frankfurt a.M. hub	45,216
Mannheim hub	26,550
VDE 8.1, ABS Nuremberg - Erfurt	29,862
Combined cargo transport / transhipment stations	221,251
Rhine-Ruhr Express (RRX)	1,289
Passing tracks for 740m trains	111,164

Project	Reduction of GHG emissions (in t CO_2-e p.a.)
Projects in the planning stage	
ABS Hanover - Berlin (Lehrter Stammbahn)	7,646
ABS Hof - Marktredwitz - Regensburg - Obertraubling (Eastern Corridor South)	39,723
ABS Lübeck - Schwerin/Büchen - Lüneburg	2,671
ABS Weimar - Gera - Gößnitz	13,185
ABS/NBS Hamburg - Hanover and others (Alpha-E)	58,243
ABS/NBS Hamburg - Lübeck - Puttgarden (hinterland connection FBQ)	66,664
ABS/NBS Hanau - Würzburg / Fulda - Erfurt	42,180
Hamburg hub	84,077
Cologne hub	37,980
Munich hub	37,280
Corridor Mittelrhein: Target network I (includes NBS/ABS Mannheim - Karlsruhe, NBS Frankfurt - Mannheim, ABS Cologne/Hagen - Siegen - Hanau, among others)	65,133
NBS Dresden - border D/CZ (- Prague)	14,927
Total	**1,199,782**

Back to the overview

1.1.3. Reduction in track access charges for rail freight

Budget chapter and item:	**1210 682 05**
Eligible expenditures 2019:	**€340.0 million**
GHG emission reduction:	**0.932 million t CO_2-e in 2019**
Other indicators:	**75 grant recipients with a grant > €500,000**
Funding share:	**N/A**
Assumptions and limitations: Evaluation report determines CO_2 savings only in total for the funding period 1.7.2018 to 31.12.2020. The share for 2019 is estimated approximately from the ratio of funding.	
Links: https://www.eba.bund.de/SharedDocs/Downloads/DE/Finanzierung/Foerderung_anteiliger_Trassenentgelte/41_Bekannntgabe_Beihilfe_2019.pdf;jsessionid=700E31E121F7D5E2695715AB8E35F1.live11312?__blob=publicationFile&v=5	

The pro rata subsidy of track access charges in rail freight transport creates an essential incentive to secure existing rail freight transport on the railways as well as incentives to shift freight transport from road to rail. To this end, funding from the federal budget is made available to the companies active in rail freight transport via DB Netz AG.[14]

Funding is available for all transport operations that serve the national or cross-border carriage of goods within the scope of DB Netz AG's system of track prices. Funding is provided for the DB Netz AG track charge, which is levied per kilometre. Journeys for measurement and of construction machines, as well as auxiliary trains are excluded from the subsidies. The subsidy amount relates to the net track charge.

The grant recipients with grants of more than €500,000 are published in accordance with § 6 (5) of the funding guideline for the 2019 working timetable period: https://www.eba.bund.de/SharedDocs/Downloads/DE/Finanzierung/Foerderung_anteiliger_Trassenentgelte/41_Bekannntgabe_Beihilfe_2019.pdf;jsessionid=700E31E121F7D5E2695715AB8E35F1.live11312?__blob=publicationFile&v=5

Further information on funding can be found at the following link: https://fahrweg.dbnetze.com/resource/blob/3981380/6b38756ffcfda733b6da3bec288b24f4/Trafoeg-Praesentation-data.pdf

Model calculations of the evaluation carried out in 2021 show that without the funding, 2.4 million tonnes more CO_2-e would have been emitted in the 2.5 years of the previous funding period (01.07.2018-31.12.2020).

The evaluation does not provide a separate overview of the funding in 2019, but only calculates the CO_2 savings in total for the entire funding period. The share for 2019 is therefore estimated approximately from the ratio of funding: the funding for the entire funding period amounted to €875 million, so that with a share of 38.9%, the avoided CO_2 emissions for 2019 are estimated at 0.932 million t CO_2-e.

Back to the overview

[14] Funding guidelines available at: https://www.eba.bund.de/SharedDocs/Downloads/DE/Finanzierung/Foerderung_anteiliger_Trassenentgelte/41_Foerderrichtlinie.pdf?__blob=publicationFile&v=8

1.1.4. Measures to reduce noise pollution from existing federal railways

Budget chapter and item:	**1202 891 05**
Eligible expenditures 2019:	**€148.9 million**
GHG emission reduction:	**N/A**
Other indicators:	**86km of noise-reduced route**
	53.5km of noise barriers erected in 2019
	1,628 subsidised soundproof windows
Funding share:	**N/A**
Assumptions and limitations: --	
Links: https://www.bmvi.de/SharedDocs/DE/Artikel/E/schiene-laerm-umwelt-klimaschutz/laermvorsorge-und-laermsanierung.html	

The implementation of the goals for shifting traffic to the railways depends on whether the necessary acceptance can be created for this. For decades, intensive work has been done to improve noise protection on and along the railways. Noise reduction measures are being 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 for Noise Abatement on Existing Railway Lines of the Federal Railways”. Beneficiaries are buildings constructed before 1 January 2015. The same applies to residential buildings on land that has been designated for residential use before 1 January 2015.

Back to the overview

1.1.5. Subsidies to private companies for investing in combined transport

Budget chapter and item:	**1210 892 41**
Eligible expenditures 2019:	**€43.0 million**
GHG emission reduction:	**0.127 million t CO_2-e**
Other indicators:	**1.76 billion tkm transport performance**
Funding share:	**N/A**
Assumptions and limitations: Source: Report on the evaluation of the "Guideline on the promotion of transhipment 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 value calculated from the relief effect due to the additional transhipment volume of all CT terminals funded since 1998. It is not possible to calculate the relief effect only on the basis of the funding measures implemented in 2019.	
Links: https://www.bmvi.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 promotes the new construction and expansion of combined transport (CT) transhipment facilities[15] of non-federally owned companies. The promotion of combined transport contributes to an additional transhipment volume in combined transport and thus at the same time to a reduction of transport on the roads.

For the year 2019, the additional transhipment based on the subsidies for CT terminals used in 2019 is assumed to have a relief effect on transport performance of 1.76 billion tkm. This relief effect comprises 1.55 billion tkm for CT of road-rail, and 0.21 billion tkm for CT of inland waterway-road. Assuming that per tkm 73.7g CO_2 are avoided for road-rail CT and 61.9g CO_2 are avoided for inland waterway-road CT, a total relief of 0.127 million t CO_2-e was achieved in 2019 via the subsidised CT terminals.

Back to the overview

[15] Combined transport (CT) is a special form of freight transport in which loading units (containers, swap bodies or truck semi-trailers) are transported over longer distances by rail or waterway. The HGV is only used on the shortest possible route to transport the loading units to a CT transhipment facility or to collect them from there and take them to the unloading point.

1.2. Alternative drive systems and fuels

1.2.1. Measures for the expansion of electric mobility

Budget chapter and item:	**6092 683 04**
Eligible expenditures 2019:	**€226.3 million**
GHG emission reduction:	**N/A**
Other indicators:	**1236 beneficiaries**
	827 charging stations installed
	7,287 subsidised e-vehicles
	104 research projects
	80 electromobility concepts
Funding share:	**N/A**
Assumptions and limitations: --	
Links: see overview and individual examples of the ministries	

Electromobility is a central element of a clean and decarbonised mobility sector. Thanks to its higher efficiency and the increased use of energy from renewable sources, it enables a reduction of greenhouse gases and air pollutants and thus makes a crucial contribution to achieving climate and immission protection targets.

The federal government's goal is to successfully manage the far-reaching transformation towards electromobility. Germany is to become a lead market and lead provider for electromobility. For this reason, the four ministries involved – BMWi, BMVI, BMU and BMBF – are supporting research and development (R&D) in this area, taking into account the recommendations of the progress report of the National Platform for Electric Mobility. In addition to the proven R&D measures, "technical lighthouse projects" are being established, innovative technologies are being tested at different stages of development and under real conditions in order to accelerate their further development and to gain insights into, among other things, the integration of energy systems, energy consumption and the climate and environmental impacts of electromobility, measures to secure the availability of raw materials, the integration of electric vehicles into mobility concepts and the effectiveness of regulatory measures. In addition, it is important to strengthen international cooperation, advance innovative charging concepts and open up further market segments of vehicles for electromobility.

Overview of the ministry programmes:

Ministry – Programme	Eligible expenditures (in € million)	Impact indicators	Links
BMBF	75.0	549 beneficiaries	https://www.werkstofftechnologien.de/programm/batterieforschung/
BMWi	60.0	189 beneficiaries 627 charging stations installed	https://www.bmwk.de/Redaktion/DE/Artikel/Industrie/elektromobilitaet-foerderprogramm-elektro-mobil.html
BMU funding programme "Renewably Mobile"	23.0	92 beneficiaries	https://www.erneuerbar-mobil.de/foerderprogramme
BMU's Clean Air Programme	10.4	57 beneficiaries 4,117 funding commitments issued for vehicles by 31.12.2019	https://www.erneuerbar-mobil.de/foerderprogramme

Ministry – Programme	Eligible expenditures (in € million)	Impact indicators	Links
BMU funding for electric buses in public transport	20.7	17 beneficiaries 1,548 funding commitments issued for e-buses by 31.12.2019	https://www.erneuerbar-mobil.de/foerderprogramme
BMVI Electromobility Funding Guideline	37.1	332 beneficiaries 200 charging stations installed 1,622 subsidised e-vehicles 104 research projects 80 electromobility concepts	https://www.ptj.de/elektromobilitaet-bmvi

In detail:

1. BMBF:

In the case of electric cars, a large proportion of the emissions occur during vehicle and battery production. Batteries account for 30 - 60% of CO_2 emissions in vehicle production. Reducing this carbon footprint is therefore a key factor in increasing the sustainability of electromobility. One focus of the BMBF's research funding is therefore battery research: from battery materials to battery cell production and battery systems. In addition to the CO_2 reduction potential, resource-conserving production processes can also significantly decrease the reliance on raw materials that are difficult to obtain, such as cobalt or lithium. For example, intelligent, digitalised production processes cause a reduction in production scrap. In addition, the development of alternative battery cell chemistries can reduce the use of ecologically critical materials (e.g. fluorinated electrolytes) or difficult-to-obtain raw materials (e.g. cobalt) or replace them with sustainable alternatives. The recycling of end-of-life batteries and production scrap can also significantly reduce the utilisation of primary materials. The ecological footprint of battery cell production thus becomes smaller and, on the other hand, represents a new source of scarce resources such as lithium.

All of the above-mentioned goals are part of the umbrella concept "Research Fab Battery". The BMBF has been bundling its funding activities within this umbrella concept since the end of 2018. Electromobility is not the only area of application for the initiatives, but it is a very crucial one. This includes international cooperation for the research and development of rechargeable batteries. Two examples of the initiatives of the umbrella concept are:

ProZell Competence Cluster – Research Network to Strengthen National Battery Cell Production

The "ProZell" competence cluster investigates and develops innovative processes for the value chain of lithium-ion battery cells and solid-state batteries and supports the implementation of a competitive cell production in Germany.

Battery 2020 – Battery Materials for Future Electromobile and Stationary and Further Applications

In the long term, enabling significantly higher ranges for electric vehicles will be necessary. Key approaches include the improvement of battery materials and the development of new battery systems. Research in this area is being conducted jointly by industry and science as part of the Battery 2020 programme.

2. BMWi:

The holistic view of the electromobility system is at the heart of BMWi funding for research and development activities on electromobility**.** It therefore encompasses all components of electromobility. This includes the topics of drive technology, battery research, energy research, standardisation, strengthening the value chain, connected cars, fleet and logistics concepts, digitalisation, grid integration and the intelligent billing of electricity at charging points and infrastructure. Project examples are:

ELBE – Electrify Buildings for EVs

In order to accelerate the mobility transition in Hamburg, the "ELBE" research project aims to create up to 7,400 charging points on private properties. The new infrastructure is being created primarily in residential buildings, commercial properties or on commercially used areas. In this way, charging

processes are to be increasingly made possible for people at home, in their neighbourhoods or their places of work, as well as at retail outlets and for company vehicle fleets. An intelligent energy concept will manage the additional energy demand without grid expansion. An interface between the decentrally controlled charging points and the central load management of the electricity grid enables forward-looking grid control and ensures security of supply. The main focus is on the technical and economic feasibility and, beyond that, on the possibility of further expansion in line with market developments. New business models that combine charging processes with the integration of vehicles as decentralised and mobile storage units play an important role here. In order to avoid complex technical requirements and high costs for grid upgrading and not to exceed the maximum grid load, the charging points are supplemented by intelligent load management, which centrally controls the available power at the charging points depending on the situation in the distribution grid.

Daten Tanken – Data-based business models for charging infrastructure

The aim of the research association "Daten Tanken" (refuelling data) is to establish an efficient and grid-compatible charging infrastructure for electric vehicles in the city of Dresden and thus contribute to future-oriented private mobility, environmentally friendly inner-city logistics, innovative business models and an economically viable charging infrastructure for electric mobility. In Dresden, 186 charging points are being built in public areas and 110 charging points in semi-public areas. The expansion of the fast and normal charging infrastructure in public spaces integrates electric vehicles into the concept of multimodal mobility points, which interlink existing mobility offers of the environmental network (public transport, sharing offers) and thus facilitate the transfer between car, bicycle and public transport. The content of the project is integrated into the Green City Plan of the city of Dresden, which focuses on the digitalisation of transport systems and their networking with public transport, urban logistics and the electrification of transport. Additional services such as intelligent route and charging management, forecasts on grid utilisation, grid-friendly and grid-serving charging control, etc. are intended to increase the economic efficiency of the charging infrastructure.

LamA – Charging at the Workplace – Nationwide development of charging infrastructure at Fraunhofer institutes in eligible municipalities

The joint project "LamA – Charging at the Workplace" aims to establish charging infrastructure for electric vehicles at 37 Fraunhofer institutes throughout Germany. By 2022, 440 standard charging points and a further 40 fast charging points are to be set up. The charging points are available to employees, company car fleets and third parties. Stuttgart, Freiburg and Dresden are the lighthouse locations in the project. In addition to the installation of the charging infrastructure and the associated construction of demonstration areas (real laboratories), associated R&D services are being provided. The key topics of maximising the user group, maximising utilisation, realising an operating concept, acceptance analyses and knowledge transfer are the focus of the research team's work. A special focus of the research activities is the investigation of new business models through the integration of fleet and charging management for company car fleets.

chargeBIG – Innovative, cost-efficient, highly scalable and grid-serving charging infrastructure with 100 charging points in a Stuttgart multi-storey car park

The chargeBIG research project is developing a novel, cost-efficient, highly scalable and at the same time grid-serving charging infrastructure for multi-storey car parks and is thus helping to ensure that innovative technologies are tested under real conditions. Instead of installing costly charging columns at each parking space, the necessary components, such as fuses, residual current circuit breakers, charge controllers and measuring devices, are combined in a central location. There is only one connection cable per electric car at each of the individual parking spaces. This approach means that car parks can be electrified across the board at low cost. The charging concept works with a central control unit that supplies power to and controls all charging points at the respective parking spaces. The available electrical power is intelligently distributed to all charging vehicles through individual load management. chargeBIG reacts flexibly to other consumers in the grid and uses the electric vehicles as a controllable load. The solution for 20 to over 100 parking spaces enables optimal use of the available power grid. By centralising special components for safety and control of the charging system in one unit, considerable costs can be saved. During the project, 100 charging options for electric vehicles were created in a MAHLE Group car park in Stuttgart, including AC chargers with up to 7.4kW or 22kW and a DC fast charger with up to 120kW, which is supplied from a battery storage system.

ALaPuN – Automatic charging system for cars and light commercial vehicles

In keeping with the innovative charging concepts, the ALaPuN project is developing an automatic charging system consisting of a special charging column, a charging robot and adapted charging sockets. The entire system will first be tested under laboratory conditions and then on a test site. Electric vehicles can be charged quickly, safely and conveniently. For autonomously driving vehicles, it also opens up new possibilities and business models, as the charging stations can be controlled and left independently. This improves the utilisation of existing charging capacities and contributes to grid stability through controllable charging processes and innovative battery use. An automatic conductive charging system increases the attractiveness of electromobility enormously: the elimination of manual connection means a great gain in convenience for the user. This increases acceptance and makes electric driving easier for people with physical disabilities. In the course of ALaPuN, a prototype of the charging system is being developed that meets the safety requirements but is not yet ready for the market.

3. BMU:

Renewably Mobile

The focus of the "Renewably Mobile" funding initiative is on research and development projects that tap the energy and climate policy potential of electromobility and at the same time contribute to strengthening the competitive position of German industrial sectors. Accordingly, the established cooperation between lead sectors and science is to be intensified and networking between the individual sectors strengthened. The R&D projects are intended to contribute to reducing the overall system costs of electromobility, lowering hurdles in the industrialisation of the new technology, removing barriers to purchase and integrating electromobility economically into the energy transition. Pilot tests and field trials are supported. In addition, the conversion of vehicle fleets to electric vehicles is promoted:

An exemplary funding field is the operation and accompanying research for electric heavy goods traffic on motorways and trunk roads with charging via overhead lines:

- eHighway A1 Schleswig-Holstein: 10km
- Electrification A5 Frankfurt-Darmstadt 10km
- eWayBW B462: around 250,000km travelled annually by electric trucks during pilot phase

Immediate Action Programme for Clean Air:

On 28 November 2017, the federal government and the participating *Länder* and municipalities agreed on an immediate action programme to improve air quality in cities. Among other things, this includes the measures "Electrification of urban commercial transport" and "Electrification of taxis, rental cars and car-sharing vehicles". This is because converting the vehicle fleets of taxi companies, tradespeople and other businesses as well as transport and delivery services to electric vehicles can make an important contribution to reducing air pollution in urban areas.

Electric buses in public transport:

Local public transport (LPT) can make an important contribution by reducing journeys in motorised private transport through attractive offers. At the same time, however, greenhouse gas emissions from public transport journeys themselves must be further reduced in order to achieve the goal of climate-neutral transport in the long term. Electrification of the vehicle drive is the most efficient way to achieve this, also for buses. If electricity from renewable energy sources were used, an almost complete reduction of greenhouse gas emissions from local buses would be possible. In addition, electric buses also improve air quality and reduce noise pollution.

The BMU has therefore set itself the goal of supporting the market introduction of electric buses in Germany with appropriate funding. The BMU grants an investment subsidy to transport companies that purchase plug-in hybrid buses with external recharging facilities or purely electric battery buses and use them in regular service.

4. BMVI:

The priorities of the BMVI's electromobility programme are to support the market ramp-up through targeted funding of municipalities in the procurement of electric vehicles and in the development of the charging infrastructure required for operation, as well as in the development of municipal

electromobility concepts. The procurement support is aimed directly at building up the battery-electric fleet and includes municipal fleets as well as municipally integrated commercial fleets. The goal is the sustainable development of electric mobility and charging infrastructure in local municipalities. The electromobility concepts examine questions relating to fleet and infrastructure development in advance and thus pave the way for strategic fleet development. Link: www.ptj.de/elektromobilitaet-bmvi

Back to the overview

1.2.2. Subsidies for the purchase of electric vehicles

Budget chapter and item:	**6092 893 01**
Eligible expenditures 2019:	**€98.0 million**
GHG emission reduction:	**N/A**
Other indicators:	**61,724 subsidised vehicles in 2019**
Funding share:	**6.7%** (= subsidies paid out / purchase prices of subsidised vehicles)
Assumptions and limitations: The GHG savings are not readily quantifiable, which is why the number of subsidised vehicles (BAFA data) has so far been used as a substitute measure of subsidy efficiency.	
Links: https://www.bafa.de/DE/Energie/Energieeffizienz/Elektromobilitaet/elektromobilitaet_node.html	

The federal government has set itself the goal of promoting the sale of new electric vehicles with the help of an environmental bonus. This can make a significant contribution to reducing air pollution while at the same time strengthening the demand for environmentally friendly electric vehicles.
The funding programme is implemented by the Federal Office of Economics and Export Control (BAFA).

Back to the overview

1.2.3. National Hydrogen and Fuel Cell Technology Innovation Programme 2016 to 2026 (NIP)

Budget chapter and item:	**1210 892 03**
Eligible expenditures 2019:	**€60.5 million**
GHG emission reduction:	**N/A**
Other indicators:	**178 approved H_2 vehicles of which** **- 33 passenger cars** **- 25 buses** **- 120 industrial trucks**
	25 filling stations/generation plants
	28 approved R&D projects in 2019
	152 ongoing R&D projects in 2019
Funding share:	**N/A**
Assumptions and limitations: Specifications on the type of hydrogen are contained in the funding guidelines	
Links: An overview of funded measures can be accessed on the BMVI's interactive funding map under the National Investment Programme for Hydrogen and Fuel Technology funding programme: https://www.bmvi.de/SharedDocs/DE/Artikel/foerderlandkarte-bmvi-iframe.html	

Hydrogen and fuel cells are a useful complement to battery-powered vehicles in the transport sector. With the National Hydrogen and Fuel Cell Technology Innovation Programme (NIP), the Federal Ministry of Transport and Digital Infrastructure has an established programme to promote research and development (R&D) measures as well as concrete implementation in investments in the area of market activation in the transport sector. The use of green hydrogen in fuel cell vehicles enables holistic CO_2-free transport across all transport modes. The measures of the NIP include fuel cell and hydrogen applications in the transport sectors road, rail, water and air as well as in special applications.

Example projects from 2019:

Development and testing of a fuel cell system as well as a mobile and self-sufficient refuelling device in the field of application of heavy commercial vehicles

In the "FC-Truck" project, a fuel cell system is being developed that meets the requirements of a heavy commercial vehicle in long-distance transport in terms of range and performance. In order to better realise future electric vehicle concepts in trucks, an adapted vehicle design will be used. Furthermore, a sustainable and short-term implementation solution for the hydrogen infrastructure for refuelling commercial vehicles will be developed and provided. Finally, the fuel cell long-distance truck will be operated under real conditions in order to gain experience and advance future developments. In this way, the project lays the foundation for the use of hydrogen fuel cell trucks to decarbonise heavy-duty transport with its high emissions.

Realisation and testing of a push boat as a test vehicle for a hybrid drive system powered by fuel cells and accumulators for use on inland waterways

The ELEKTRA research project is concerned with the feasibility of alternative low-emission energy supply systems on inland vessels and their economic use. For the first time, an all-electric and hybrid propulsion concept consisting of fuel cells and accumulators is being designed on an inland vessel and the dynamic interaction of the energy sources is being researched and optimised with regard to the maximum range of the canal barge. The hybrid drive is being tested in Berlin and Brandenburg – in regional traffic as well as for supra-regional journeys to Hamburg. The aim is to create incentives for inland navigation to realise emission-free freight transport on water in the future.

Development and production of a waste collection vehicle and a sweeper with a modular system of hydrogen tanks and fuel cells

The project developed an electric drive train for waste collection vehicles and sweepers, whose energy supply is implemented with fuel cells in combination with batteries as a power buffer. The development and subsequent testing is intended to determine whether the vehicle can be brought to market in series production without serious losses in load capacity and volume.

The project thus creates the necessary foundations for the series production of emission-free commercial and special vehicles, which is planned to follow the project, and can contribute to air pollution control, especially in municipalities and inner cities.

Development of an emission-free modular propulsion concept based on fuel cells for a passenger aircraft with at least 4 passengers

The project objective is to research and further develop the fuel cell propulsion system for a 4-passenger aircraft under aspects of efficiency, safety and everyday life. Building on existing components, the operating principles for reliability, long-range and high-altitude suitability of the systems are to be researched and improved in such a way that the conditions for use in regional air traffic are met. The main components of the drive train consisting of hydrogen tank, battery hybrid unit, electric motor and propeller will be revised and adapted to the optimised fuel cell system. A significant advantage in the research arises from the planned integration of the fuel cell hybrid drive to be developed into the already existing HY4 flight platform. On the way to emission-free air mobility based on hydrogen and fuel cells, this project can thus make an important contribution.

Development and validation of a high-performance fuel cell drive for electric hybrid multiple units in a modular traction system

About 40% of the German rail network, especially in the area of local passenger rail transport, has not yet been electrified with overhead lines. These are currently served primarily by diesel trains. With the development of a fuel cell drive for multiple units, the X-EMU project (high-performance fuel cell battery drive for hybrid multiple units in a modular traction system) is making an important contribution to the replacement of diesel-powered rail vehicles with emission-free trains and thus to the climate-friendly change in transport. Specifically, the project is pursuing the integration development of a fuel cell into a modular traction system for rail vehicles. The modularity of the developed system makes it possible to use different technology solutions (battery/fuel cell) flexibly for diverse route requirements and infrastructure conditions.

Back to the overview

1.2.4. Subsidies for the construction of charging infrastructure for electric vehicles

Budget chapter and item:	**6092 893 02**
Eligible expenditures 2019:	**€11.6 million**
GHG emission reduction:	**N/A**
Other indicators:	**2,070 charging points installed in 2019; of which:** **- 194 fast charging points** **- 1,744 normal charging points** **- 132 modernisations**
Funding share:	**N/A**
Assumptions and limitations: Source: Internal reports on the funding guideline Charging Infrastructure for Electric Vehicles of 13.02.2017.	
Links: https://www.bmvi.de/SharedDocs/DE/Anlage/G/konsolidierte-foerderrichtlinie-lis-29-06-2017.pdf?__blob=publicationFile	

The federal government's goal is to support the market ramp-up of e-vehicles and to work towards its stabilisation. In order to achieve this goal and to meet the requirements of the EU's Alternative Fuels Infrastructure Directive (AFID), the development of charging infrastructure is a necessary prerequisite. The funding guideline aims to initiate an area-wide, needs-based and user-friendly network of charging infrastructure so that the user of an e-vehicle can recharge quickly and easily anywhere in Germany. The funding guideline therefore primarily serves to establish fast-charging infrastructure. In addition, the further expansion of the normal charging infrastructure is also to be supported in order to cover customer needs depending on driving and parking behaviour (e.g. overnight charging of e-vehicles for residents of apartment buildings without a garage in the city, car sharing, recharging during visits to department stores, restaurants, cinemas, etc.).

Back to the overview

1.3. Public transport

1.3.1. Financial assistance to the *Länder* for regional and local public-transport rail infrastructure projects with eligible costs of more than €50 million each

Budget chapter and item:	**1206 882 02**
Eligible expenditures 2019:	**€104.0 million**
GHG emission reduction:	**N/A**
Other indicators:	**24 projects**
Funding share:	**N/A**
Assumptions and limitations: --	
Links: --	

Due to its high energy efficiency and high degree of electrification, public passenger transport is associated with significantly lower greenhouse gas emissions per person-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 (LPT). However, shifting from private motorised transport to public transport is not only aimed at reducing greenhouse gas emissions, it also plays an important role in making cities and communities more environmentally friendly.

As regional and local transport is the responsibility of the *Länder* and municipalities, the federal government provides indirect support in the form of financial assistance. Impact indicators are not available in aggregated form. Therefore, representative examples are described below.

Ulm tramway, new construction of line 2 (Baden-Württemberg)

The project aims to make local public transport connections attractive for people in the city of Ulm and thus offer a fully-fledged alternative to motorised private transport. The measure includes the new construction of tram line 2 to the school centre at Oberer Kuhberg and to the university/science city with a total length of 9km and 18 new stops. The tram extension will reorganise and improve the route concept for road and bus traffic in Ulm city-wide. In addition, the traffic-volume focal-points along the planned route sections will be connected to Ulm's main railway station without changing trains, so that an optimal link between inner-city public transport, local rail passenger transport and long-distance rail passenger transport will also be created. The shorter journey times and the direct and transfer-free routes will improve the public transport services in Ulm and thus provide an attractive alternative to the use of the private car.

Strasbourg tramway, extension of tram line D (Baden-Württemberg)

The measure aims to improve and stabilise cross-border public transport in the trinational metropolitan region of the Upper Rhine. The new construction of the 4km long tram line, planned jointly by the two cities of Strasbourg and Kehl, starts on the French side and continues over a new tram bridge across the Rhine to the Kehl town hall on the German side. The section on the German side includes the new construction of the 1.67km-long section from the middle of the new tram bridge (border) over the Rhine to the new terminal stop "Kehl-Rathaus". This tram connection will give the city of Kehl direct and convenient access to Strasbourg's "Gare Centrale" railway station, and the "Kehl Bahnhof" stop will provide transfer opportunities to national rail transport. With the final stop "Kehl Rathaus", an attractive and significantly better connection to the city centre is achieved. Thus, an efficient alternative to motorised individual transport will be created so that the very close links between the Strasbourg city community and the city of Kehl can also be managed in the future.

Chemnitz: expansion of the light rail system as the "Chemnitz Model" (Saxony)

The measure "Chemnitz Model" aims to link the city and the surrounding area by means of a transfer-free rail connection. A means of transport is to start in the city centre of Chemnitz and end at the

stations of the regional centres, using the track networks in the city and of DB Netz AG as far as possible. In addition to improving the public transport services between the city of Chemnitz and the region, improvements are also to be made in important inner-city routes. The expansion and realisation of the network as the “Chemnitz Model” is planned in several expansion stages, which in their implementation will enable the gradual commissioning of the individual lines. Overall, the project will significantly increase the efficiency and attractiveness of public transport services in the Chemnitz-Erzgebirge region.

Magdeburg: expansion of the tram network (Saxony-Anhalt)

The aim of the project is to extend the network of the tramway in Magdeburg by a total of approx. 13.5km, thus creating essential prerequisites for the further development of the state capital Magdeburg. The districts Reform, Neustädter Feld and Kannenstieg will be accessible by tram for the first time, giving more than 44,000 inhabitants a new connection to the network. A total of 37 pairs of stops will upgraded or made barrier-free and will ensure optimal accessibility and short distances to reach the tram. A dense timetable and more direct connections to the city centre will significantly shorten travel times by public transport, especially to the city centre. Therefore, a greater use of public transport is expected, which should relieve the environment of car traffic and climate-damaging greenhouse gas emissions. Accompanying urban design measures in the new districts served by the tramway will increase quality of life for residents.

Hamburg: extension of the U4 to Elbbrücken (Hamburg)

The measure “Extension of the U4 to Elbbrücken” (on a section totalling 5km) will make the eastern part of HafenCity in Hamburg accessible by underground. In addition to the construction of the line and a new underground station, the measure also includes a connecting structure to the S-Bahn at Elbbrücken. There are to be 14,000 places of work within walking distance of the new station. It is expected that 17,500 passengers will use the new underground line every day, more than a third of whom will transfer to and from the S-Bahn at Elbbrücken station. This shift of passengers will reduce the capacity load of S-Bahn traffic on the approach to the main station from the south of Hamburg. As a result, the new underground connection will contribute to increasing the attractiveness of both the HafenCity district and the city’s public transport services.

Back to the overview

1.3.2. Investment subsidies for regional and local public transport projects over €50m to Deutsche Bahn AG and companies majority-owned by the federal government

Budget chapter and item:	**1206 891 01**
Eligible expenditures 2019:	**€100.9 million**
GHG emission reduction:	**N/A**
Other indicators:	**35 projects**
Funding share:	**N/A**
Assumptions and limitations: --	
Links: --	

Due to its high energy efficiency and high degree of electrification, public passenger transport is associated with significantly lower greenhouse gas emissions per person-kilometre than private motorised transport. Shifting from private motorised transport to public transport can therefore reduce greenhouse gas emissions from the transport sector. This presupposes an attractive and user-friendly rail-bound local public transport (ÖPNV) or rail passenger transport. However, shifting private motorised transport to public transport is not only aimed at reducing greenhouse gas emissions, but also plays an important role in making cities and communities more environmentally friendly.

Since regional and local rail transport is the responsibility of the *Länder* and municipalities, the federal government indirectly supports local public transport projects in which DB AG or companies predominantly owned by the federal government are the project sponsors through financial aid. Impact indicators are not available in aggregate. Therefore, representative examples are described.

New construction and expansion of the S-Bahn Breisgau

The project "Breisgau S-Bahn 2020" of the Zweckverband Regio-Nahverkehr Freiburg (ZRF) aims at an integrated regional local transport concept in which the various means of public transport in the region – local rail passenger transport (SPNV), regional bus and light rail lines in Freiburg – are expanded and linked together in order to offer passengers in all parts of the region a fully-fledged alternative to the use of motorised private transport. The SPNV measures include the upgrading of the following lines: Rhine Valley Railway, Breisach Railway, Höllental Railway West and East, Three Lakes Railway, Elz Valley Railway, Münstertal Railway, Kaiserstuhl Railway and Müllheim - Neuenburg. For this purpose, the track plan including the associated control and safety technology, electrification of line sections as well as adaptations of the stations will be carried out to varying extents.

Extension of the Nuremberg suburban railway, second construction phase Bamberg - Nuremberg - Hartmannshof

The aim of the measure is to create the necessary infrastructure for an attractive 20-minute service interval on the Nuremberg - Erlangen route and a 20/40-minute interval further on to Forchheim as well as an hourly service as a regional train to Bamberg. To achieve this, the four-track Nuremberg-Fürth line will be adapted to S-Bahn operation (Steinbühl station), a separate S-Bahn track will be built between Fürth (Bay) main station and the Eltersdorf junction, and the existing double-track line between Eltersdorf and Forchheim/Ostfranken will be adapted to the requirements of regular S-Bahn operation. Overall, this will lead to an increase in demand for SPNV and a reduction of negative externalities in competing motorised individual transport.

Rhine-Main urban railway, new construction of Gateway Gardens station

The aim of the measure is to connect the new urban district Gateway Gardens, which is being built on the site of a former American housing estate near Frankfurt, to the existing local public rail transport system. The project includes the relocation of the S-Bahn line between Frankfurt Stadium and Frankfurt Airport Regional Station as well as the construction of the new Gateway Gardens transport station. This will provide the new district with a direct and convenient transport connection to Frankfurt city centre. For commuters in particular, travel times will be considerably reduced, as in future journeys by shuttle

bus between the regional railway station and Gateway Gardens will no longer be necessary. In addition, the highly frequented road network around Frankfurt Airport and the Frankfurter Kreuz interchange will be relieved.

Extension of the Heilbronn urban railway; Neckarsulm - Bad Rappenau section

The overall project Stadtbahn Heilbronn Nord aims at linking the infrastructure facilities of the railway infrastructure companies of DB AG with those of the Albtal-Verkehrsgesellschaft and the inner-city rail transport of Stadtwerke Heilbronn in order to achieve a significant improvement of the SPNV/ÖPNV in the Heilbronn area. The project includes in particular the construction of 4 new stops and the modernisation/expansion of 9 existing stations on the DB lines from Neckarsulm via Bad Friedrichshall-Jagstfeld in the direction of Neckarelz and Sinsheim to achieve the light rail standard as well as the expansion and upgrading of the track infrastructure and line equipment in the stations of Bad Rappenau, Bad Wimpfen and Bad Friedrichshall-Jagstfeld. The direct connection of the northern hinterland with the city centres of Heilbronn and Neckarsulm will create an attractive alternative to motorised individual transport, contributing to environmental and climate protection.

Expansion of the Rhine-Main S-Bahn; Bad Vilbel - Frankfurt/Main West section

The project aims to optimise the quality criteria in local rail passenger transport – speed, punctuality and regularity. The four-track extension of the highly frequented Main-Weser railway will give the S6 suburban railway service between Frankfurt West and Bad Vilbel its own tracks so that it can run unaffected by faster long-distance and freight traffic, increase the punctuality of the trains and enable a stable 15-minute service interval at all stations. For this purpose, two additional tracks will be laid over a length of 12.6km. The implementation of the project will also improve the quality of S-Bahn services for users: five stations will be converted to be barrier-free and one new station will be built. In addition, the existing level crossings will be adapted and noise protection measures implemented.

Back to the overview

1.3.3. Local authority public transport pilot projects from 2018 to 2020 to complement the Immediate Action Programme for Clean Air

Budget chapter and item:	**1210 633 81**
Eligible expenditures 2019:	**€43.0 million**
GHG emission reduction:	**N/A**
Other indicators:	**Reduction of NO_x and PM10 emissions**
Funding share:	**N/A**
Assumptions and limitations: In addition to model-related uncertainty, the change in user behaviour due to the Covid-19 pandemic had an impact on the implementation and evaluation of the measures.	
Links:	

With the aim of improving air quality in inner cities, transport projects in five representative model cities with nitrogen oxide pollution were supported from October 2018 to June 2021 as part of the model projects in addition to the "Clean Air Emergency Programme 2017-2020". The selected model cities Bonn and Essen in North Rhine-Westphalia and Herrenberg, Mannheim and Reutlingen in Baden-Württemberg implemented measures to improve public transport and bicycle traffic. In addition to bicycle lanes, measures were implemented in the areas of service improvement (e.g. increased frequency, introduction of new lines), tariff adjustments and pricing (e.g. improved conditions, new tickets), traffic management (e.g. dynamic speed control on main traffic routes) and digital networking (e.g. a mobility app). As part of the evaluation, the question was examined to what extent the funded measures bring about an improvement in air quality in the cities, here in particular the reduction of nitrogen dioxide pollution.

All of the cities' packages of measures had a positive effect on local air quality. The effectiveness of the individual measures varied due to various factors such as the size of the city or the scope and expansion of the public transport system as well as the design of the measures implemented. Overall, in all model cities, the measures analysed can potentially save an average of 82,000 car trips per day. This can potentially lead to a daily saving of 264,000 car km as well as 165kg NO_x and 66t CO_2.

Back to the overview

1.4. Waterways

1.4.1. Replacement, expansion and new construction projects relating to federal waterways

Budget chapter and item:	**1203 780 02**
Eligible expenditures 2019:	**€122.0 million**
GHG emission reduction:	**0.345 million t CO_2-e p.a.**
Other indicators:	**1,564t p.a. reduction of air pollutants**
Funding share:	**N/A**
Assumptions and limitations: According to the Environmental Report on the 2030 Federal Transport Infrastructure Plan (FTIP) (p. 143), the implementation of the projects of priority need of the 2030 FTIP in the area of federal waterways leads to the reductions mentioned. Statements on CO_2 savings and the reduction of air pollutants are only available from the FTIP assessment in relation to expansion measures. These always refer to the completed overall project and are based on the assumptions on the emission factors of the individual modes of transport applicable at the time of the FTIP forecast. Statements on CO_2 savings from annually implemented financing shares of the expansion measures cannot be derived from this. There are no project related statements on maintenance and replacement measures and no methodology for determining direct CO_2 /air pollutant savings. However, the environmental and climate friendliness of waterways as a mode of transport can be seen in the overall balance of the annual greenhouse gas emissions of the modes of transport. According to a comparison of emissions by the Federal Environment Agency (see https://www.umweltbundesamt.de/themen/verkehr-laerm/emissionsdaten#verkehrsmittelvergleich_g%C3%BCterverkehr_tabelle), the current transport performance of waterways results in savings of around 4 million tonnes CO_2 per year.[16] Maintenance and replacement measures on the federal waterways serve to continue to enable freight transport on waterways and to maintain the emission savings. Every additional tonne of freight shifted from road to waterway, which can be achieved e.g. through expansion measures, results in a further reduction of CO_2 pollution in the transport sector. Quantification and project-specific allocation are not possible.	
Links: Methodology for the FTIP: https://www.bmvi.de/SharedDocs/DE/Artikel/G/BVWP/bundesverkehrswegeplan-2030-inhalte-herunterladen.html https://www.bmvi.de/SharedDocs/DE/Anlage/G/BVWP/bvwp-methodenhandbuch.pdf?__blob=publicationFile	

By financing replacement, expansion and new construction measures on German waterways, the federal government creates the conditions for the use of waterways for transport purposes and supports sustainable inland navigation. As an efficient and high-performance alternative to trucks, the port-ship-waterway system can contribute to transporting more goods by inland waterway vessel and at the same time relieve road congestion, thus reducing emissions of greenhouse gases, NO_x and particulate matter.

According to the Environmental Report on the 2030 Federal Transport Infrastructure Plan (FTIP), the implementation of the expansion projects of the priority demand of the 2030 FTIP in the area of federal waterways will lead to a reduction of GHG emissions of more than 0.34 million tonnes CO_2-e p.a. after completion of the expansion measures. There is no methodology for determining a project-related CO_2 /air pollutant reduction for maintenance and replacement measures.

Back to the overview

[16] Per tonne-kilometre (tkm), inland navigation saves around 80 g of CO_2 compared to road transport (emissions table for freight transport, uba 2020), i.e. existing transport by waterway (around 50 billion tkm/year) saves around 4 million t of CO_2 per year compared to transport by road (around 500 billion tkm).

1.4.2. Maintenance of transport infrastructure

Budget chapter and item:	**1203 780 01**
Eligible expenditures 2019:	**€60.0 million**
GHG emission reduction:	**N/A**
Other indicators:	**N/A**
Funding share:	**N/A**
Assumptions and limitations: According to the comparison of emissions by the Federal Environment Agency (see https://www.umweltbundesamt.de/themen/verkehr-laerm/emissionsdaten#verkehrsmittelvergleich_g%C3%BCterverkehr_tabelle), a saving of around 4 million t CO_2 per year results from the current transport performance of the waterways (see footnote 15). Maintenance and replacement measures on the federal waterways serve to continue freight transport on the waterways and to maintain the emission savings. Every additional tonne of freight traffic shifted from road to waterway, which can be achieved e.g. through expansion measures, results in a further reduction of CO_2 pollution in the transport sector. Quantification and project-specific allocation are not possible.	
Links: --	

Financing is provided for the maintenance of the target condition for the use of the environmentally friendly transport mode of waterways. Dredging to maintain the target condition is used, for example, to preserve the waterways for transport use.

Impact indicators are not available in aggregated form. Therefore, examples of infrastructure measures (maintenance and expansion investments) on federal waterways are described (extract from Transport Investment Report 2019 https://www.bmvi.de/SharedDocs/DE/Publikationen/G/verkehrsinvestitionsbericht-2019.html)[17]:

West-German-Canals (page 309 Transport Investment Report 2019)

The West-German-Canals connect the Rhine and the ports in the Ruhr area with the North Sea ports and, via the Mittelland-Canal, with the Baltic Sea ports and the East European waterway network.

Expansion target/project status:

- Traffic with cargo ships (135m long, 11.4m wide) and pushed convoys (185m long, 11.4m wide) with 2.8m unloading depth; 2-layer container traffic.
- Projected traffic release of the Rhine-Herne-Canal in 2030
- Projected opening of the Datteln-Hamm-Canal (western section) to traffic in 2025
- Projected traffic release Dortmund-Ems-Canal (DEK)-South in 2026

Ongoing activities 2019:

- DEK-Süd: Route expansion measures incl. bridge adaptations
- Basic repair of the small locks on the Wesel-Datteln-Canal (WDK)
- Rhine-Herne-Canal: Preparation for the replacement of the second lock chamber in Wanne-Eickel, route expansion measures, bridge and culvert adjustments
- in the rest of the West-German-Canals, replacement investments and extensive measures to prevent and repair mining damage were carried out

Moselle (page 311 Transport Investment Report 2019)

The Moselle connects the Rhine with the Saar (Saarland), Luxembourg and the Lorraine region (France).

[17] Expenditures reported in the 2019 Transportation Investment Report include expenditures that were not eligible for Green German Federal securities.

Expansion target/project status:

- Traffic with cargo ships (135m long, 11.4m wide) and pushed convoys (185m long, 11.4m wide) with an unloading depth of approx. 2.8m; 2-layer container traffic.
- Due to the high traffic load, the construction of second lock chambers at the 10 Moselle barrages between Koblenz and Trier is necessary.
- The second lock chambers have already been completed at the barrages in Fankel and Zeltingen; the other structures will follow successively depending on the available resources.

Ongoing activities 2019:

- The second lock chamber in Lehmen is to be built according to the "new Moselle standard". The corresponding plan amendment procedure has been completed in the meantime.
- The completion of the second lock chamber in Trier is imminent. This will be followed by trial operation.
- The rehabilitation work on the invert of the Koblenz weir is well advanced. Preliminary planning for the construction of the new weir will begin soon.

Elbe-Side-Canal (page 305 Transport Investment Report 2019):

The Elbe-Side-Canal connects the seaport of Hamburg with the Mittelland-Canal and the northwest German inland waterway network. When the water level of the Elbe is low, it also serves as a substitute route for the Hamburg-Magdeburg route in conjunction with the Mittelland-Canal.

Expansion target/project status:

- Traffic with cargo ships (100m long, 11.4m wide) and pushed convoys (SV, 185m long/ 11.4m wide) with 2.8m unloading depth; 2-layer container traffic.

Ongoing activities 2019:

- General repair of the ship's hoist in Lüneburg West trough under construction.
- Second descent structure in Lüneburg. Preparation of planning approval procedure.

Dortmund-Ems-Canal (northern section) (page 301 Transport Investment Report 2019)

The Dortmund-Ems-Canal connects the seaport of Emden with the Mittelland-Canal and, further on, via the West-German-Canals, also with the Ruhr area and the Rhine. The connection to the Küsten-Canal has also gained great regional importance.

Expansion target/project status:

- Planned traffic with cargo vessels (110m or 135m long, 11.40m wide).
- At present, navigability on the DEK northern stretch is possible with a European vessel unloaded up to 2.70m.
- Replacement of the 5 locks Bevergern, Rodde, Venhaus, Hesselte, Gleesen as well as route and bridge adjustments.

Ongoing activities 2019:

- Start of construction activity at the Gleesen site.

Kiel-Canal (page 293 Transport Investment Report 2019)

Important trade and transport link to the Baltic Sea region, especially for the German North Sea ports. The Kiel-Canal is part of the Trans-European Transport Network (TEN).

With around 32,000 ship passages per year, the NOK is the busiest artificial sea lane in the world.

Expansion target / project status:

- Navigability of the canal with ships up to L = 280m, W = 32.5m, D = 9.5m.
- Improve the meeting possibilities in the extension area and thus reduce the passage time in the canal.

Ongoing activities 2019:

- Clearing work
- Construction of a transshipment point for building materials
- The movement of dry dredged material onto land-based movement areas
- Preparation of further movement areas
- Site installation on the Flemhude rinsing field advanced

Back to the overview

1.5. Cycling

1.5.1. Construction of bike lanes including maintenance (federal highways)

Budget chapter and item:	**1201 746 22**
Eligible expenditures 2019:	**€85.0 million**
GHG emission reduction:	**N/A**
Other indicators:	**159km of newly built cycle paths**
Funding share:	**N/A**
Assumptions and limitations: km data is not available for maintenance measures for existing cycle paths.	
Links:	

The federal budget finances the construction and maintenance of cycle paths on federal roads. A total of 159km of newly constructed cycle paths on federal roads were completed in the 2019 financial year. In addition to new construction measures, maintenance measures were also financed, although no km figures are available here.

Project example: Federal road B 49, maintenance Cochem - Klotten with extension of the existing cycle path:

The aim of transport policy is to create safe and attractive cycle paths along the Moselle. Numerous areas have already been upgraded, increasingly also the sections that are difficult to build; now also in the area between Cochem and Klotten. This section is of particular importance for cycling because Cochem is a tourist centre on the Moselle and the number of cyclists is correspondingly high. In contrast to most other sections, there is no equivalent alternative to the cycle path along the B 49 here, as there is a nature reserve on the right-hand side of the Moselle and no continuous cycle connection.

The length of the cycle path is approx. 2,460m, the usable width is 2.50m. Together with the construction of the cycle path, the road condition of the B 49 will be adapted to the requirements of the regular traffic volume.

Back to the overview

1.5.2. Allocations and grants in the area of cycling

- *Implementation of the National Cycling Plan – 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 super-highways*
- *Subsidies for the implementation of the German Unity Cycle Route*

Budget chapter and items:	**1210 632 01, 1210 686 01, 1210 882 02, 1210 891 02**
Eligible expenditures 2019:	**€3.1 million**
GHG emission reduction:	**N/A**
Other indicators:	**50 projects**
Funding share:	**N/A**
Assumptions and limitations: --	
Links:	

The federal government supports cycling through measures for the implementation of the National Cycling Plan 2020, through the promotion of investment-based model cycling projects and through grants for the expansion of Germany's cycling network. In addition, financial assistance is given to the *Länder* for investments in cycling.

The measures of the National Cycling Plan are diverse and range from the construction/conversion of cycle paths and the construction/conversion of cycle path bridges/cycle path underpasses/intersections/reconstruction of "free right turners" to the construction of bicycle parking facilities (bicycle racks, bicycle boxes, bicycle parking garages) to the organisation of the National Cycling Congress, the Bicycle Climate Test and the German Bicycle Award. The variety of categories of funding in the National Cycling Plan makes it difficult to define indicators. Therefore, representative examples are described. In addition, reference is made to the final report by Prognos (2020) "Balancing the National Cycling Plan 2020".[18] According to this report, the National Cycling Plan was able to initiate multi-layered improvements that strengthen cycling as a whole. Through the recommended measures for the expansion of cycling infrastructure, for example, it has improved the framework conditions for cycling and thus contributed to increased cycling use.

Funded were:

- 11 projects were funded through allocations to *Länder* and other legal entities under public law, including
  - Concepts for integrating cycling into future urban transport structures with autonomous vehicles

    In the future, autonomous vehicles will greatly change the coexistence of means of transport in urban areas. The project "RAD-AUTO-NOM – Concepts for the integration of cycling in future urban traffic structures with autonomous vehicles" is therefore intended to make a practice-relevant contribution to traffic regulations, traffic infrastructure and urban space design as well as vehicle and traffic technology required in the future with regard to the interaction between bicycles and autonomous vehicles. The target groups are planning and engineering offices as well as road construction and urban planning offices, vehicle manufacturers and suppliers as well as start-ups. In the reporting period, urban planning concepts for the design of cycling facilities in urban environments with autonomous vehicles were developed. For 2022, it is planned to develop recommendations for action to identify and avoid conflicts between cyclists and autonomous vehicles.
  - Illuminating the number of unreported safety-critical incidents between cyclists, cyclists and cars, pedestrians and public transport.

[18] https://www.bmvi.de/SharedDocs/DE/Anlage/StV/bilanzierung-nrvp-2012-2020.pdf?__blob=publicationFile

Up to now, the trigger for infrastructure changes to increase road safety has mostly been accident figures. According to experts, however, the number of unreported accidents involving cyclists with minor injuries or safety-critical incidents is significantly underestimated. The aim of the National Cycling Plan project "Illuminating the number of unreported safety-critical incidents between cyclists, cyclists and cars, pedestrians and public transport" is to make a representative statement on the real road safety situation. For this purpose, a survey instrument was designed during the reporting period, which is to be evaluated in a feasibility study and applied in an observational study in three major German cities. In particular, the influence of infrastructural as well as situational and personal factors (e.g. perception of safety) on prevalence will be investigated. As a result, design and action recommendations for municipalities will be elaborated in 2022 and the survey instrument will be made publicly available for further research.

  - With the help of rides in a 3D bicycle simulator, the SuSi3D research project aims to evaluate and derive infrastructure measures for intersections that are adapted to the needs of cyclists.
- 27 projects were supported by grants to companies under private law, including
  - Bicycle monitor

    The Bicycle Monitor is a representative survey conducted by the SINUS Institute as part of the promotion of cycling. It surveys the subjective mood of cyclists in Germany at intervals of about two years. For this purpose, about 3,100 citizens between the ages of 14 and 69 are surveyed online about their mobility behaviour and preferences. The monitor is representative according to gender, age, education and location size. The Bicycle Monitor is funded within the framework of the National Cycling Plan. The findings on the acceptance of cycling measures and attitudes in transport behaviour also serve as orientation for the direction of cycling policy.
  - Further development of cycling education in schools with special attention to safe cycling of children in real traffic scenarios.

    The overall objective of the project is to improve children's cycling safety. Cycling education often takes place exclusively in a protected space, e.g. in protected areas of youth traffic schools, schoolyards or in closed-off public road space. Thus, children are not sufficiently prepared for dangers of traffic and do not learn to react appropriately to the unexpected. The aim of the project is to investigate under which conditions school cycling education can take place in real road traffic and what support schools need to integrate this form of education.
  - Cycle lanes: designing efficient and safe infrastructure

    The aim of the project is to analyse the traffic characteristics of cycling traffic flows on cycle lanes and at the interfaces between cycle lanes and the rest of the road and cycling network. In particular, the influence of the heterogeneous composition of cycling traffic on the traffic flow will be investigated and taken into account. Based on the findings, traffic control measures and intelligent traffic systems (ITS) will be presented for use at intersections of cycle lanes and tested and evaluated with the help of a simulation laboratory. In particular, the quality of the traffic flow for cycling is taken into account in order to be able to evaluate the attractiveness of cycling. Suitable substitute parameters are also used to investigate traffic safety aspects.
- 1 project for the construction of a fast cycle route
- With the aim of expanding the "Cycling Network of Germany", 11 cycling sites were completed along the German Unity Cycle Route.[19]

Back to the overview

[19] https://www.radweg-deutsche-einheit.de/radstaetten/

2. International cooperation

Global challenges such as climate change, species and resource protection require global responses. Germany is highly committed to sustainable development in international cooperation and thus supports developing and emerging countries in their transition towards more environmentally sustainable economies and societies. This is done within the framework of the United Nations Sustainable Development Goals, the Paris Agreement and other relevant international agreements and initiatives. Key areas of focus are:

- Climate change mitigation and adaptation,
- Transition to low-emission, sustainable energy systems, including the development of renewable energy production facilities,
- Improvements in energy and resource efficiency in production and buildings,
- Protection of marine and terrestrial habitats and biodiversity and
- The sustainable use of natural resources and sustainable agriculture.

Important results of development cooperation are presented in the federal government's 16th Development Policy Report[20] :

- The German government has worked internationally to increase ambition in climate protection. The German contribution to international climate financing more than doubled from 2014 to 2020 – from €2 billion to more than €5 billion.
- 350 million people in over 100 developing and emerging countries are covered by climate risk insurance as a result of the initiative launched by Germany.
- At the multilateral level, Germany is one of the largest donors to the Green Climate Fund (GCF) and the Global Environmental Facility (GEF).
- Germany supports more than 70 countries in their transition to sustainable energy. Germany is one of the largest bilateral donors in the energy sector.
- In total, the BMZ supports 660 protected areas covering an area of two million square km, six times the size of Germany.
- In total, the BMZ contributes to the protection of 130 million ha of forest worldwide.

Germany is also working with other industrialised countries to jointly accelerate the energy transition and exploit the potential for innovation and sustainable growth. Examples of this include the German government's 21 global energy partnerships and dialogues with countries such as Australia, Japan and the USA, which focus on exchange and cooperation on energy transition issues.

The eligible expenditures of the sector amount to €2,981.7 million and are distributed over 12 budget items in the areas of

- Bilateral financial cooperation (3 budget items with €1,099.9 million in eligible expenditures),
- Bilateral technical cooperation (1 budget item with €723.7 million in eligible expenditures),
- International climate and environmental protection (2 budget items with €541.0 million in eligible expenditures),
- Multilateral cooperation (2 budget items with €392.9 million in eligible expenditures) and
- Specific funding (4 budget items with €224.1 million in eligible expenditures).

[20] https://www.bmz.de/de/aktuelles/entwicklungspolitischer-bericht-der-bundesregierung

2.1. Bilateral financial cooperation

2.1.1. Bilateral financial cooperation – grants

Budget chapter and item:	**2301 896 11**
Eligible expenditures 2019:	**€658.5 million**
GHG emission reduction:	**N/A**
Other indicators:	**428 projects**
Funding share:	**cf. list of example projects**
Assumptions and limitations: The funding share is the share of eligible expenditures in 2019 in the total commitment amount of the project. CO_2 impacts are scaled to eligible expenditures in 2019; other indicators apply to overall project; ex-ante estimates, internal BMZ calculations	
Links: cf. project name in list of example projects	

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

Due to the large number of projects, the expected impact can only be reported for a selection of projects. The eligible expenditures of the sample projects correspond to 21% of the eligible expenditures of the entire budget item.

Project name (Click on the project name to visit the website)	Eligible expenditures (in € million)	Reduction of GHG emissions (in t CO_2-e p.a.)	Further indicators, description of the project objective	Funding share of the Green German Federal securities 2020 (in %)
Hydropower and renewable energy development in the North Western Frontier Province	0.2	86	The project as a whole is expected to contribute to energy access for 13,000 people.	2.5%
1000 Islands – Renewable Energy for Electrification Programme (REEP)	3.9	4,870	The project as a whole is expected to provide an additional generation capacity of (in MW): 31.	5.4%
Programme Decentralised Power Supply through Renewable Energies	12.5	18,087	The project as a whole is expected to contribute to energy access for 4,822 people.	25.3%
Promoting energy efficiency in public buildings and hydropower – Greening Public Infrastructure	5.0	3,869	The project as a whole is expected to provide an additional generation capacity (in MW) of 146 and contribute to energy access for 35,200 people.	6.1%

Project name (Click on the project name to visit the website)	Eligible expenditures (in € million)	Reduction of GHG emissions (in t CO_2-e p.a.)	Further indicators, description of the project objective	Funding share of the Green German Federal securities 2020 (in %)
Energy efficiency programme – district heating	0.6	3,790	-	6.7%
Programme Promotion of Renewable Energies and Energy Efficiency IV	3.3	6,511	-	16.7%
Promotion of investments in energy efficiency and renewable energies via the banking sector ("EcoLoans") – Comp. 3	0.5	5,328	-	25.4%
Energy efficiency in rural power supply	4.9	2,842	The project as a whole is expected to contribute to energy access for 15,000 people.	14.2%
Promotion of renewable energies	6.0	4,263	-	22.4%
Promotion of investments in energy efficiency and renewable energies via the banking sector ("EcoLoans") – Comp. 5	1.5	883	-	5.9%
Expansion of renewable energies	2.1	967	The project as a whole is expected to provide an additional generation capacity of (in MW): 15.	9.7%
Solar Energy and Energy Efficiency Promotion Programme	3.7	5,179	The project as a whole is expected to provide an additional generation capacity of (in MW): 10.	53.7%
Energy Efficiency in Public Buildings II (IKLU)	2.5	1,000		11.4%
Promoting energy efficiency and access to energy	1.9	408	-	5.1%
Promotion of energy-efficient residential buildings in India	10.7	185		4.1%
Energy-efficient rehabilitation of student dormitories in Northern Macedonia (IKLU)	2.5	275		11.5%
Open Programme Energy Sector	3.2	72	-	3.1%
Regional electricity savings programme	2.7	6,284		4.3%

Project name (Click on the project name to visit the website)	Eligible expenditures (in € million)	Reduction of GHG emissions (in t CO_2-e p.a.)	Further indicators, description of the project objective	Funding share of the Green German Federal securities 2020 (in %)
Improving power transmission in the West Zone of Bangladesh	2.4	20,006	-	16.1%
Sustainable power supply in the Southern Division	0.3	1,865		2.0%
Grid densification programme to increase electricity access in rural areas	0.4	112	-	4.6%
Investment programme electricity distribution I	1.2	88	The project as a whole is expected to enable 150km of new power lines.	4.0%
WAPP 4-country transmission line (CLSG)	23.5	40,972	-	75.9%
REDD Early Movers (REM) Mato Grosso	8.0	440,000	-	47.1%
Sustainable hydropower II	7.7	8,865	-	3.3%
Renewable Energy Financing Facility II	7.3	14,790	-	3.5%
Agago-Gulu-Lira transmission line	6.0	-	Amount of energy transmitted, distributed and transferred in MWh per year: 394,200, 83km new lines	13.1%
The following projects contribute to better management of protected areas of the size mentioned. The impact arises from the entire project duration, but improved management is not quantifiable. Conservation projects generally also contribute to climate protection (avoided degradation) and adaptation (strengthening the resilience of ecosystems), but there is no reliable data on this at project level (CO_2-e).				
Protected areas and biodiversity	1.6		1,118,795ha protected area	11.0%
Tropical Forest Conservation III	0.2		793,980ha protected area	5.7%
Biodiversity and adaptation to climate change	1.9		7,457,651ha protected area	16.8%
ASEAN Biodiversity Centre Small Grants Programme	0.2		444,727ha protected area	2.3%
Sustainable resource management in Cameroon	2.9		316,778ha protected area	19.9%
Transboundary biosphere reserve WAP region	10.0		376,000ha protected area	100.0%

Back to the overview

2.1.2. Financial cooperation with regions

Budget chapter and item:	**2301 896 01**
Eligible expenditures 2019:	**€242.7 million**
GHG emission reduction:	**N/A**
Other indicators:	**20 projects**
Funding share:	**cf. list of example projects**
Assumptions and limitations: The funding share is the share of eligible expenditures in 2019 in the total commitment amount of the project. CO_2 impacts are scaled to eligible expenditures in 2019; other indicators apply to overall project; ex-ante estimates, internal BMZ calculations	
Links: cf. project name in the list of example projects	

The eligible expenditures of bilateral financial cooperation with regions finance regional approaches as well as regional actors for which there are no partners under international law. The projects are intended to contribute to climate change adaptation, climate, environmental and resource protection and/or biodiversity support in the regions.

The expected impact is only reported for a selection of projects for which quantitative indicators can be estimated. The eligible expenditures of the sample projects correspond to 39% of the eligible expenditures of the entire budget item.

Project name (Click on the project name to visit the website)	Eligible expenditures (in € million)	Reduction of GHG emissions in t CO_2-e p.a.)	Other indicators	Funding share of Green German Federal securities 2020 (in %)
Eco Business Fund	15.0		150,000ha of rehabilitated agricultural land	100.0%
Integrated Tiger Habitat Conservation Programme Asia	0.2		5,360,000ha protected area	1.1%
4E Initiative SSA	15.0	54,651	The project as a whole is expected to provide an additional generation capacity of (in MW): 205	100.0%
Citizens' Energy Fund Facility for Energy Inclusion – OnGrid (FEI-OnG)	25.0	122,778	The project as a whole is expected to contribute to energy access for 955,250 people and provide an additional generation capacity of (in MW): 1	100.0%
Regional Energy Efficiency Fund Western Balkans and Neighbourhood Regions (GGF VII)	22.5	23,300		100.0%
DC Programme "Green Citizen Energy for Africa" – Here: FC module "Citizen Energy Fund RDI-OGEF"	15.0	30,800	The project as a whole is expected to contribute to energy access for 280,000 people and provide an additional generation capacity of (in MW): 2	100.0%
Promotion of ecocorridors in the South Caucasus	1.7		Contribution to the conservation of protected areas (92,640ha) and sustainable forestry (14,000ha)	21.8%

Back to the overview

2.1.3. Bilateral financial cooperation – loans

Budget chapter and item:	**2301 866 11**
Eligible expenditures 2019:	**€198.8 million**
GHG emission reduction:	**N/A**
Other indicators:	**70 projects**
Funding share:	**cf. list of sample projects**
Assumptions and limitations: The funding share is the share of eligible expenditures in 2019 in the total commitment amount of the project. CO_2 impacts are scaled to eligible expenditures in 2019; other indicators apply to overall project; ex-ante estimates, internal BMZ calculations	
Links: cf. project names in the list of sample projects	

The eligible expenditures of bilateral financial cooperation loans are used to support partner countries of German development cooperation. Loans support projects in countries with appropriate debt sustainability that contribute to climate change adaptation, climate, environmental and resource protection and/or support for biodiversity.

The expected impact is only reported for a selection of projects for which quantitative indicators can be estimated. The eligible expenditures of the sample projects correspond to 14% of the eligible expenditures of the entire budget item.

Project name (Click on the project name to visit the website)	Eligible expenditures (in € million)	Reduction of GHG emissions (in t CO_2-e p.a.)	Other indicators	Funding share of Green German Federal securities 2020 (in %)
Renewable Energies – Solar Power Plant	0.1	150	The project as a whole is expected to provide additional generation capacity (in MW): 50	0.4%
Energy efficiency programme	7.2	8,654		41.2%
Promotion of renewable energies in West Africa	1.8	1,088		7.1%
Renewable Energies Programme: Photovoltaic Pilot Plant	3.7	728	The project as a whole is expected to provide additional generation capacity (in MW): 17	16.5%
Encourage solar funds	15.0	171,734	The project as a whole is expected to provide additional generation capacity (in MW): 312	100.0%

Back to the overview

2.2. Bilateral technical cooperation

2.2.1. Bilateral technical cooperation

Budget chapter and item:	**2301 896 03**
Eligible expenditures 2019:	**€723.7 million**
GHG emission reduction:	**N/A**
Other indicators:	**649 projects**
Funding share:	**N/A**
Assumptions and limitations: --	
Links: https://www.giz.de/de/ueber_die_giz/63962.html	

Through bilateral technical cooperation (TC), the German government helps to increase the technical, economic and organisational knowledge and skills of people and organisations in partner countries and to support them in achieving national climate and environmental goals through the effective, efficient and sustainable use of resources. Bilateral TC mainly comprises advisory services through the deployment of experts (e.g. in government bodies or other organisations in partner countries), financing of advisory services and the limited provision and financing of material goods and equipment. Primarily, the federally owned Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is entrusted with the implementation of TC projects.

Eligible expenditures contribute to climate change adaptation, climate protection, environmental and resource protection, and/or support for biodiversity.

No aggregated data on eligible expenditures is available. The following selection of projects represents exemplary impacts (approx. 5% of eligible expenditures).

Project name (Click on the project name to visit the website)	Eligible expenditures (in € million)	Description
Energy efficiency consulting for companies in Ukraine	1.4	The project supports Ukrainian companies in energy modernisation and advises them on the efficient use of energy in order to exploit existing energy saving potential. The project enabled companies to save 10,835MWh of energy and reduce CO_2 emissions by 3,583 tonnes (as of May 2020).
South African-German Energy Programme (SAGEN)	3.5	The project advises the national electricity supplier on the grid integration of renewable energies and supports selected municipalities regarding energy efficiency measures (e.g. street lighting, biogas use in sewage treatment plants). In total, the project enabled 220,000 tonnes of CO_2 emissions to be saved. Since 2012, about 4,000MW of renewable energy have been integrated into the grid. The project also helped reduce electricity consumption in more than 90 municipalities by a total of 200,000MWh per year. The project's support increased the installed capacity of rooftop photovoltaic systems from about 30MW (2014) to more than 500MW (2019). In addition, the project supported the introduction of a quality label for photovoltaic systems (PV GreenCard).

Project name (Click on the project name to visit the website)	Eligible expenditures (in € million)	Description
GET.invest (part of the multi-donor platform GET.pro)	0.1	The project supports private project developers and companies in investing in and accessing financing for sustainable energy in partner countries, especially in sub-Saharan Africa. The focus is on project development and bankability support as well as advisory services and financing (also through FC), complemented by market information, events and cooperation with associations. In 2019, the project connected 13 projects and companies with financiers, with an investment volume of approximately €210 million. If realised, these investment projects would correspond to approx. 160MW of installed capacity, approx. 3.5 million people with access to energy, and annual emission reductions of approx. 170,000t CO_2-e.
Energy Systems of the Future II Brazil	2.8	The project promotes conditions for the integration of renewable energies into the Brazilian energy system and into long-term energy planning by advising local institutions and political decision-makers. So far, it has supported the establishment of 19 local energy cooperatives with an installed capacity of 26 megawatt-peak (MWp), supplying more than 1,700 consumption units. At the same time, the project has trained 600 teachers and 4,200 professionals in demand-driven courses for the 4E market. Also, as a result of the project, the number of PV systems in net metering increased from 30 (2012) to more than 430,300 PV systems (2021) with an installed capacity of 5,100MW.
Energising Development	7.6	EnDev builds local markets for the dissemination of renewable energy and more efficient technologies for households, social institutions and businesses. EnDev is currently active in 21 partner countries on three continents (Africa, Asia and Latin America). Since the project's launch in 2005 to 2020, access to climate-friendly energy has been achieved for 23.8 million people (920,000 in 2020), 28,500 social infrastructures (1,096 in 2020) and 73,550 micro, small and medium-sized enterprises (19,688 in 2020). The carbon-dioxide emission savings directly associated with the EnDev measures amount to 16.9 million tonnes of CO_2-e (2.33 million tonnes of CO_2-e in 2019) and have been steadily increasing.
Contribution to Peru's environmental goals (ProAmbiente II)	5.9	The project accompanies the management of nature conservation areas according to international standards such as Green List in order to preserve biodiversity in protected areas and buffer zones. The marketing of environmentally friendly products and sustainable tourism improves the living conditions of the local population and the acceptance of nature conservation.
Indo-German Energy Programme – Access to Energy in Rural Areas (IGEN-Access)	0.6	The Indo-German Energy Programme – Access to Energy in Rural Areas (IGEN-Access) aims to create favourable framework conditions for rural energy companies that rely on renewable energies. In this way, energy services are to become easily accessible to the rural population. IGEN-Access focuses on expanding the market and promoting innovative business models to make sustainable energy accessible in rural areas. The programme is divided into three strategic components: Private Sector and Innovation Support; Access to Finance Solutions; and Public Support Programmes. The focus of the measures is on energy in agriculture, clean energy for cooking, rural electrification and productive energy use.

Project name (Click on the project name to visit the website)	Eligible expenditures (in € million)	Description
Renewable Energies and Energy Efficiency (4E) – Phase II	1.1	The aim of the 4E project, which is co-financed by the EU, is to further develop renewable energies and energy efficiency, to strengthen the corresponding legal framework and to increase the competence of the actors involved.
Forest and climate protection (FORCLIME)	3.3	The German-Indonesian forest and climate protection project provides support and technical assistance in the implementation of forest reforms that point the way forward for Indonesia's forest policy. The aim is to improve the legal and institutional framework in the areas of forest management, biodiversity conservation and reduction of greenhouse gas emissions from the forest sector. In the long term, better forest governance should lead to a reduction in greenhouse gas emissions from the forest sector. This should also have a positive impact on the livelihoods and capacities of people living in and near forests.
Conservation and sustainable use of natural resources II	5.1	The environmental project contributes to making the use of natural resources in and around protected areas sustainable and climate-smart. It works in the regions of DIANA, Boeny, Atsimo-Andrefana and Analamanga. By adding value to natural resources, the population learns to manage protected areas and forests sustainably and to generate a sustainable income, for example through honey, ecotourism, timber or "green" charcoal. Effects: 980,000ha of forest and protected areas are protected by use rights and the local population is committed to their preservation. 6,430 households, of which about 35% were women, were able to improve their income by an average of 77% through activities in the promoted value chains such as honey, raffia, timber, "green" charcoal or eco-tourism. Madagascar now has better legal and institutional instruments for sustainable development in the country. At government level, there are forestry and environmental policies, as well as strategies for the restoration of forest landscapes and wood energy supply. 87 municipalities and three regions have land use plans. In micro-mining, 135 miners were trained in gemmology to better appreciate the quality of their finds and to strengthen their sales position. 30 women process and sell costume jewellery made of lower-quality stones and have thus been able to improve their income.
Governance and sustainable management of the natural resources of the Comoé and Tai regions	4.2	The project supports rural producers in the Comoé and Taï region to become more self-organised and efficient. It also uses innovations, such as technical innovations for tree care, to improve their agricultural productivity while conserving resources. The project also aims to improve protected area management. It also advises on developing and implementing local agreements on governance and the sustainable use of natural resources. The work focuses on four thematic areas: - Capacity building of local groups on natural resource governance and agricultural productivity through technical and organisational advice - Capacity building of the national park administration through technical and organisational advice - Provision of empirical knowledge from development cooperation to the government - Introduction and dissemination of agroforestry measures

Project name (Click on the project name to visit the website)	Eligible expenditures (in € million)	Description
Decarbonisation of the energy sector in Bosnia and Herzegovina	1.0	The project supports the Ministry of Foreign Trade and Economic Relations (MoFTER) and the entity ministries of energy in the field of individual and organisational capacity development. The aim is to establish well-functioning departments that plan, coordinate and monitor the implementation of long-term decarbonisation scenarios aligned with the 2050 climate goals. By assisting in the establishment of a digital monitoring system operated by the state and entity energy ministries, their statistical agencies and all other relevant authorities, progress towards decarbonisation will be monitored. In addition, the project will provide public institutions with the skills needed to conduct public consultations and initiate dialogue between civil society and the public and private sectors. In addition, energy managers at state, entity, cantonal and municipal levels will be trained to improve the quality of the data to be collected with the planned monitoring system. By promoting decarbonisation in the residential sector, the project supports the relevant authorities in developing a national energy efficiency programme. The work on the programme is carried out through a participatory process that involves financing institutions, businesses and households in the planning process at an early stage. The project is also developing digital tools, improving the capacity of the actors responsible for implementing the programme, targeting the public and private sectors as well as citizens through public awareness campaigns and suggesting changes to the current legislation.

Back to the overview

2.3. International climate and environmental protection

2.3.1. Investments to protect the climate and biodiversity abroad

Budget chapter and item:	**1602 896 05**
Eligible expenditures 2019:	**€453.0 million**
GHG emission reduction:	**N/A**
Other indicators:	**399 projects in total funded in 2019, of which 45 new projects from 2019**
Funding share:	**N/A**
Assumptions and limitations: --	
Links: https://www.international-climate-initiative.com/de Biennial report on climate finance: https://unfccc.int/sites/default/files/resource/191220_%204%20Biennial%20Report_englisch_final%20_sauber.pdf	

The International Climate Initiative (IKI) for international financing of climate protection and biodiversity finances diverse projects that help developing and emerging countries to reduce greenhouse gas emissions in any sector, adapt to the consequences of climate change, preserve or build natural carbon reduction through forests, swamps and grasslands, and protect or restore ecosystems and biodiversity.

This is intended to support the individual member countries in achieving their nationally determined contributions (NDCs) to the Paris climate targets and at the same time encourage them to formulate them more ambitiously. In addition to knowledge transfer, this also includes support for the development of analytical tools (e.g. PACTA).

Item-specific data or data at project level are currently not available. Therefore, the impact is described qualitatively for a selection of projects (approx. 4% of eligible expenditures).

Project	Eligible expenditures (in € million)	Countries	Description
Strengthening national forest monitoring	2.71	Ecuador	The project established a functioning and institutionalised national system for monitoring deforestation and forest degradation in Ecuador that meets national and international CO_2 emission accounting requirements.
NAMA Facility (German contribution to the Facility for Nationally Appropriate Mitigation Actions, NAMAs)	2.31	-	The NAMA Facility is an international climate financing programme that promotes ambitious measures to reduce greenhouse gas emissions. Under the Paris Agreement, the NAMA Facility finances Nationally Appropriate Mitigation Actions (NAMAs) and similar national initiatives in developing countries and economies in transition. The focus is on innovation and the transformation towards sustainable, carbon-neutral development. Funding is provided for technical and financial cooperation to develop tailor-made emission reduction solutions in specific sectors. In addition, the NAMA Facility supports the projects with needs-based, highly qualified expertise and facilitates the exchange of knowledge and experience.
Tunisian Solar Plan	1.95	Tunisia	The Tunisian Solar Plan defines the framework within which the Tunisian government intends to advance solar power production in its country. As

Project	Eligible expenditures (in € million)	Countries	Description
			part of the German Climate Technology Initiative, the project supports the government in the effective implementation of the solar plan and thus in the expansion of renewable energies on a large scale. This is done in the technical component of the project on several levels, for example through policy advice aimed at developing effective regulations.
Biosphere Reserve – Protected Area Management	1.70	Ecuador	The project in Ecuador strengthens the Yasuní, Limoncocha and Cuyabeno protected areas and their surroundings as part of the "Development cooperation programme for biodiversity conservation and climate change adaptation and prevention". Specifically, it promotes the improvement of management, sustainable financing and the introduction of sustainable forms of use for natural resources. This includes the development and implementation of conservation strategies, the financing of infrastructure and equipment for park staff, and the promotion of local initiatives to create environmentally sustainable sources of income.
Energy efficiency in public buildings in Turkey	1.50	Turkey	Supporting the partner ministry in Turkey to build the necessary skills and resources to effectively enforce existing legislation and improve the legal framework for increasing energy efficiency in public buildings. Since the start of the programme, 228 experts from chambers of architects, mechanical and electrical engineers and private companies have been trained on energy performance certificates and the newly developed software through train-the-trainer approaches.
Programme for the Support of the National Strategy for Adaptation to Climate Change in Mali	1.38	Mali	Advising on the development of climate change legislation and policies (achieving the NDCs)
Protection and sustainable use of the marine biodiversity of the Benguela Current Marine Ecoregion	1.37	Angola, Namibia, South Africa	Reports and recommendations on marine spatial use, several publications in specialist media, translation of educational film on spatial planning into African languages
Protected areas and other area-based conservation measures at local government level	1.33	Brazil, Ecuador, Colombia, Peru	Sharing best practices in Brazil, Ecuador, Colombia, Peru. By December 2020, 1,986 participants had successfully completed the online course on tools for municipal biodiversity protection.
Promotion of biodiversity and climate change monitoring in the Selva Maya region	1.27	Belize, Guatemala, Mexico	More efficient and effective protected area management
Climate and species protection in the Leuser ecosystem Sumatra (Life Web)	0.96	Indonesia	The Gunung Leuser ecosystem on Sumatra is one of the largest carbon sinks in Asia and has a huge biodiversity. At the same time, it is a water catchment area for millions of people. The region is threatened by logging, agriculture and settlement construction, among other things. The project supports the sustainable management of the ecosystem. Protection interests are to be reconciled with the interests of the population. It equips protected area administrations with the necessary infrastructure and advises on the introduction of structures or the

Project	Eligible expenditures (in € million)	Countries	Description
			improvement of existing facilities. New geo-information systems strengthen the planning and monitoring capabilities of authorities. In order to improve the living conditions of the population and avoid conflicts with protected areas, the project develops land use plans together with the municipalities. Measures such as agroforestry management and community forests create income opportunities for the population.
Management and disposal of existing, ozone-depleting substances in "ODS banks".	0.91	China, Colombia, Dominican Republic, Ghana, Tunisia	The project supports its partners in setting up procedures for taking back refrigeration appliances, collecting and disposing of ozone-depleting substances (ODS). First, analyses of the framework conditions, the political instruments and an inventory of the ODS banks are carried out. Based on this, the project formulates national roadmaps that contain, among other things, recommendations on political measures, sustainable financial mechanisms and a recycling and destruction infrastructure. For implementation, the project promotes help for self-help activities and workshops with stakeholders. A technology cooperation component assesses capacities for environmentally friendly management and destruction of ODS banks and promotes technological cooperation.
Conservation concessions for tropical forest protection in Indonesia	0.80	Indonesia	The Indonesian government awards conservation concessions (ERCs) to private organisations that, among other things, aim to restore forest areas destroyed by commercial logging. The project supports this policy in order to preserve endangered tropical forests in Bukit Tigapuluh National Park (Sumatra) and in Gorontalo (Sulawesi).
Implementation of the National Biocorridor Programme (PNCB) within the framework of Costa Rica's National Biodiversity Strategy.	0.78	Costa Rica	In Costa Rica, 34% of the country's territory has been designated as biocorridors under the National Biocorridor Programme (PNCB) to preserve biodiversity and its ecosystem services. Thanks to the PNCB, state environmental programmes have been implemented not only in state protected areas but also outside them. The project supported the national protected area authority, local governments and the population in jointly developing strategic plans.
Biodiversity and climate protection in the Mata Atlântica	0.74	Brazil	The Atlantic coastal forest, the "Mata Atlântica", is one of the five most important biodiversity hotspots worldwide. The project contributed to the conservation of biodiversity as well as to climate protection and adaptation to the consequences of climate change on site. To this end, selected, partly fragmented protected areas were secured and connected.

Back to the overview

2.3.2. International climate and environmental protection

Budget chapter and item:	**2310 687 01**
Eligible expenditures 2019:	**€88.0 million**
GHG emission reduction:	**N/A**
Other indicators:	**146 projects**
Funding share:	**cf. list of sample projects**
Assumptions and limitations: --	
Links: cf. project name in the list of sample projects (if available)	

The budget item on International Climate and Environmental Protection (*Internationaler Umwelt- und Klimaschutz*, IKU) finances new and particularly innovative approaches in the field of climate protection and adaptation to climate change in developing and emerging countries that contribute to the implementation of the Paris Agreement. The item covers several instruments; thus, it can fund projects by GIZ and KfW, private sponsors, churches, political foundations, municipalities or research institutions.

Due to the large number and heterogeneity of the projects, aggregation at item level is not possible. Therefore, a qualitative description of the impact is reported for a selection of projects (approx. 14% of eligible expenditures). The funding share is calculated as a share of the total costs of the project.

Project name (Click on the project name to visit the website)	Eligible expenditures (in € million)	Funding share (in %)	Description
Improving water resilience in Africa	3.0	100%	This project with the World Resources Institute aims to increase the resilience of water utilities in African countries. For this purpose, 6 cities were selected for 3 African countries, 2 per cooperation country, become pioneers in the water sector and provide examples for other cities based on concrete experiences. Information is shared openly and networks are created with civil society, academics and other institutions. German funding supports the development of framework planning and a roadmap for climate and water resilience in Africa and as well as initial implementation measures in the pilot cities.
Supporting developing countries in water, climate and adaptation management (Ethiopia), Phase II	1.0	50%	Ethiopia is strongly affected by the impacts of climate change. This concern, among other things, the availability of water, one of the key resources for the population in general and for agricultural production in particular. The project supported Ethiopian authorities at national and regional level in adequately considering climate risks in the planning of future water management, e.g. within the framework of the Growth and Transformation Plan – GTP III and the Integrated Water Resources Planning in the Abay catchment area. Furthermore, the project supported the mobilisation of financing for investments in infrastructure specifically for agricultural water use.
Integrated approach to sustainable resource conservation through income generation in the green economy with a special focus on youth, Burundi	0.4	33%	The project started in September 2019 and is still ongoing. Measures include: the establishment of craft groups to promote employment in the green economy (target: 5 functional craft groups that provide young entrepreneurs with a regular income); reforestation (the areas to be reforested have already been identified, target: 600 ha); establishment of savings groups to improve the income situation of young people affected by poverty and unemployment (target: 1,200 young people are organised in community-based savings and credit groups (VICOBAs), amongst others.

Project name (Click on the project name to visit the website)	Eligible expenditures (in € million)	Funding share (in %)	Description
IMF-Germany Climate Change Capacity Building Programme 2019 - 2022	1.0	33%	The project strengthens the capacities of finance ministries and central banks for considering needs for mitigation and adaptation to climate change in their fiscal policies.
IWRM Coastal Protection Programme Tunisia II	5.5	20%	Rising sea levels are increasingly eroding Tunisia's coasts. Therefore, this ongoing project finances, among other things, sand fills, groynes, breakwaters and the planting of dunes in order to protect ecologically important wetlands, scarce freshwater resources and coastal infrastructure. Between 2013 and 2022, about 27 of the 127km of the most affected coastline will be protected, of which approx. 5km are covered from 2019 funds. Up to 600,000 people will benefit over different phases. This includes economic actors in the region (working in fishing, hospitality and agriculture) benefitting indirectly from the project.
Community Activation for Biodiversity, Forest and Climate Protection in the Wild Coffee Forests of Ethiopia	0.4	32%	The Kafa Biosphere Reserve in southwestern Ethiopia is one of the last ecosystems providing a home for natural wild coffee, which is an important source of income for the local population. Due to illegal forest use, agricultural investment projects and climate change, the forests and thus the incomes of the local population are under severe pressure. Therefore, the aim of the project was to develop community-based action plans for renaturation and nature-friendly management, thus contributing to securing CO_2 sinks and adaptation to climate change. In this way, the income of the local population is sustained in a climate-sensitive manner.
Funding programme for municipal climate protection and climate adaptation projects (FKKP) 2017 - 2021	1.4	90%	The projects are financed via the Service Agency Communities in One World at Engagement Global. Individual project duration is usually 3 years. 11 municipal projects were funded in the period 2017-2021. Twinning projects of German municipalities with partner municipalities in DAC countries that directly and explicitly contribute to the following objectives are eligible: * Climate mitigation/reduction of greenhouse gas emissions through the use of efficient and/or regenerative technologies. * Adaptation to climate change impacts respectively strengthening the ability to adapt to climate change in regions particularly affected by it (incl. by so-called slow-onset events). * Integration of climate change mitigation and adaptation into development goals and actions of recipient municipalities, including institution building and capacity development of relevant civil society actors.

Back to the overview

2.4. Multilateral cooperation

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

Budget chapter and item:	**2303 896 09**
Eligible expenditures 2019:	**€370.6 million**
GHG emission reduction:	**N/A**
Other indicators:	**9 initiatives**
Funding share:	**N/A**
Assumptions and limitations: --	
Links: see table	

Multilateral organisations implement large programmes of considerable scope in developing and emerging countries and coordinate the contributions of various donors for this purpose. They are important actors for supporting transformation processes in partner countries. Germany therefore contributes to 9 multilateral initiatives. Quantitative impact indicators are not available or are not attributed to individual donors. Therefore, the initiatives are mostly described qualitatively:

Initiative (Click on the project name to visit the website)	Eligible expenditures (in € million)	Description
Global Environment Facility V - VII	68.7	By the end of the third year of the GEF-VII implementation period (July 2018 to June 2022), the Global Environment Facility (GEF) has financed projects with a total volume of USD2.6 billion, leveraging USD8.6 in co-financing per $ of GEF grant. In the current budget period, the GEF has already prevented the emission of 1,406 million tonnes of CO_2-e, brought 101 million ha of forests under sustainable management practices and created 762 million ha of new marine protected areas. In its latest report, the GEF independent evaluation office attests that GEF projects show a particularly high level of sustainability.
Montreal Protocol X	11.9	The Multilateral Fund for the Implementation of the Montreal Protocol covers additional costs incurred by developing countries in complying with this Protocol in terms of phasing out the use of substances that deplete the ozone layer.
Least Developed Countries Fund VIII	25.0	The Least Developed Countries Fund (LDCF) for the implementation of the Kyoto Protocol is primarily intended to promote measures in the field of adaptation to climate change in countries heavily affected by climate change but lacking the resources to address it.
Climate risk insurance (InsuResilience Global Partnership)	60.0	The InsuResilience Global Partnership implements and develops financing and insurance solutions for climate and disaster risks.
Forest Carbon Partnership Facility VII (REDD)	50.0	The Forest Carbon Partnership Facility is the largest multilateral initiative for the compensation of reduced emissions through avoided deforestation (REDD) in developing countries. Developing countries receive compensation if they protect their forests in the long term and thus contribute to the reduction of greenhouse gas emissions.

Initiative (Click on the project name to visit the website)	Eligible expenditures (in € million)	Description
Green Climate Fund I	140.0	The Green Climate Fund is a climate fund within the UN Framework Convention on Climate Change with the aim of providing financing for both mitigation and adaptation to climate change in developing countries. The Fund has now approved 200 projects in more than 100 countries with a GCF funding of USD10.8 billion. The projects supported include the large-scale development of renewable energies, the implementation of climate-friendly mobility concepts, new protective structures against storm surges and the development of early warning systems for severe weather. The fund's projects save about 2.3 bn tonnes of CO_2-e. 638 million people benefit from increased climate resilience through GCF adaptation projects.
Nationally Determined Contributions II	15.0	Developing countries are supported by Germany in making their Nationally Determined Contributions (NDCs) towards mitigation and adaptation to climate change more ambitious and in implementing them in a swift, coordinated and effective manner, while combining climate and development goals.

Back to the overview

2.4.2. Membership fees to international organisations

Budget chapter and item:	**1601 687 01**
Eligible expenditures 2019:	**€22.3 million**
GHG emission reduction:	**N/A**
Other indicators:	**27 organisations**
Funding share:	**N/A**
Assumptions and limitations: --	
Links:	

Environmental, climate and nature protection 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. To support these, the German government makes annual contributions. Examples of organisations are:

United Nations Framework Convention on Climate Change (UNFCCC)

The United Nations Framework Convention on Climate Change (UNFCCC) is the international, multilateral climate protection agreement of the United Nations. Its aim is to prevent dangerous anthropogenic – i.e. man-made – interference with the climate system. The UNFCCC was launched in 1992 at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro and entered into force two years later. In the meantime, 197 states have ratified the UNFCCC and thus almost all states in the world.

Montreal Protocol for the Protection of the Ozone Layer:

With the Montreal Protocol of 1987, a precise timetable was agreed for the global phase-out of the production and use of substances such as CFCs that destroy our ozone layer. Since 16 September 2009, the Montreal Protocol has been 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 production and consumption quantities of ozone-depleting substances fell drastically in just a few years. At the same time, the agreements of the Montreal Protocol prevented an additional increase in greenhouse gas emissions.

The BMU also supported the following international organisations in 2019:

- Permanent Secretariat for the Protection of the Rhine,
- Permanent Secretariat Protection Moselle and Saar,
- 1994 Environmental Conference on the Reduction of Sulphur Dioxide (Oslo),
- International Council for the Exploration of the Sea (Ices), Quality Assurance and Routine Data (QSR),
- Permanent Secretariat for the Protection of the Meuse,
- Permanent Secretariat Helsinki for the Protection of the Baltic Sea,
- International Panel on Climate Chage (IPCC),
- Permanent Secretariat for the Protection of the Elbe,
- Permanent Secretariat for the Protection of the Oder,
- Basel Convention (Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal),
- Permanent Secretariat for the Protection of the Danube,
- Strategic Approach to International Chemical Management (SAICM),
- Green Climate Funds,
- UNEP/UNESCO/BMU Education Programme,
- World Health Organisation (WHO),
- Vienna Convention for the Protection of the Ozone Layer,

- Secretariat for 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, as well as pesticides in international trade),
- International Panel for Sustainable Resource Management (International Panel on Resources),
- Transfer of funding for the UNEP Life Cycle Initiative,
- Contribution to the Climate and Clean Air Coalition (CCAC) Secretariat,
- Minamata Convention on the Control of Mercury,
- Permanent Secretariat of the International Zero Emission Vehicle Alliance (IZEVA).

Back to the overview

2.5. Specific funding

2.5.1. Special Initiative ONE WORLD – No Hunger

Budget chapter and item:	**2310 896 31**
Eligible expenditures 2019:	**€184.0 million**
GHG emission reduction:	**N/A**
Other indicators:	**27 projects**
Funding share:	**N/A**
Assumptions and limitations: --	
Links: All projects of the GIZ special initiative are described in more detail here: https://www.weltohnehunger.org/ (there without a breakdown of the projects by annual expenditure and also no separate presentation of the "green" projects)	

The special initiative "ONE WORLD – No Hunger" finances projects that contribute to reducing hunger and malnutrition in the world or support rural development as an important prerequisite for food security. Eligible expenditures include projects that aim at environmentally sound use of natural resources and land areas and contribute to adaptation to climate change.

Quantitative impact indicators are not available for all projects. Therefore, the available information is only reported for a selection of projects (around 27% of eligible expenditures):

Project name (Click on the project name to visit the website)	Eligible expenditures (in € million)	Impact indicators	Assumptions/Limitations
Global project on soil protection and rehabilitation for food security	22.5	78,000t CO_2-e p.a. reduction 532,552 direct beneficiaries 261,490ha protected area	Permanence factor 0.8. Calculation via area-based emission factors for the year 2020 relativised to the 2019 area achieved by the project. Conservative assumptions. 100,000ha were removed from the calculation as the data availability for these areas did not allow for meaningful modelling. The estimation is based on the Verra verified Sustainable Agricultural Land Management (SALM) method (VM0017) in the partner countries where corresponding area and farm data have already been collected. However, a smaller sample size is used than required by the Verra Standard, e.g. in the case of carbon certification. In the partner countries where detailed data is not yet available, the FAO EX-Ante Carbon Balance Tool was used.
Africa Window of the Eco-Business Fund	12.0	3,500 agricultural enterprises 60,000ha sustainably managed area	Indicator values show ex-ante determined target values over the entire project duration.

Project name (Click on the project name to visit the website)	Eligible expenditures (in € million)	Impact indicators	Assumptions/Limitations
Climate adaptation and soil rehabilitation in watersheds	1.9	Number of people supported in coping with the impacts of climate change: pro-rata value 55,104; ex-ante target value: 172,200 Sustainably managed area: proportional value: 12,800ha; ex ante values: 40,000ha	Indicator values show ex-ante estimated target values over entire project duration. Proportional value for 2019, measured against the total financing volume, was added.
Improving agricultural productivity through soil and water conservation measures	3.1	Number of people supported in coping with the impacts of climate change: pro-rata value: 5,200; ex-ante target value: 26,000 Sustainably managed area: proportional value: 3,400ha; ex-ante target value: 17,000ha	Indicator values show ex-ante estimated target values over entire project duration. Proportional value for 2019, measured against the total financing volume, was added.
GAFSP – Global Agriculture and Food Security Program	10.0		

Back to the overview

2.5.2. International energy cooperation, commodity partnerships and technology cooperation

Budget chapter and item:	**6092 687 02**
Eligible expenditures 2019:	**€20.1 million**
GHG emission reduction:	**N/A**
Other indicators:	**59 projects**
Funding share:	**N/A**
Assumptions and limitations: --	
Links: https://www.bmwi.de/Redaktion/DE/Publikationen/Energie/jahresbericht-energiepartnerschaften-2019.html	

Funding is provided for international energy cooperation. These include: measures to support and continue bilateral and multilateral cooperation, especially with the aim of promoting the German and global energy transition and finding new partners, supporting partner countries in developing a sustainable energy supply and ensuring energy security. This is done, for example, through the work of the secretariats in partner countries, training, studies and international events.

The kind of the cooperation within the framework of energy partnerships and dialogues, as well as in multilateral forums, means that no direct causal link to quantifiable CO_2 savings can be established. It is reported in the understanding that these measures make a substantial contribution to global climate protection.

In 2019, 59 projects with 21 workshops, 95 focus topics in 21 countries were realised.

Further information and details can be found in the Annual Report Energy Partnerships 2019.

Back to the overview

2.5.3. International cooperation

Budget chapter and item:	**1602 532 05**
Eligible expenditures 2019:	**€15.8 million**
GHG emission reduction:	**N/A**
Other indicators:	**91 projects**
Funding share:	**N/A**
Assumptions and limitations: --	
Links: --	

Quantitative impact indicators are not available. Therefore, a selection of programmes is described qualitatively.

Measures to develop the market mechanisms of the carbon market

68 Projects

Measures to create an international carbon market

5 Projects

This budget item includes funding of:

- ICAP Secretariat. With ICAP (International Carbon Action Partnership), Germany launched an initiative in 2007 to align and link the EU Emissions Trading Scheme (EU ETS) with other ETSs, which now comprises 31 members and 4 observers.
- Bilateral cooperation in the form of expert advice and workshops in Kazakhstan.
- Two workshops of the Carbon Market Platform, founded on the initiative of the German G7 Presidency.
- Scientific support services for the further development of European and international emissions trading and support of the Working Group on Emissions Trading (AGE).

Measures to support the European Climate Initiative (EUKI)[21]

18 projects, 20 events

The EUKI is a funding instrument of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). The overarching goals of the EUKI are to intensify cross-border dialogue and the exchange of knowledge and experience in the European Union in order to jointly advance the implementation of the Paris Agreement.

Project name	Eligible expenditures (in € million)	Impact indicators	Description
Young Energy Europe	0.7	339 young professionals from 135 companies were trained as Energy Scouts in four countries 143 tailor-made practical projects in companies were designed 600t CO_2 savings potential per year in companies were identified	Young professionals from companies in different sectors in Bulgaria, Greece, Hungary and the Czech Republic were trained as Energy Scouts and helped to monitor and reduce energy consumption in their companies.

Back to the overview

[21] https://www.euki.de/

2.5.4. Export of green and sustainable (environmental) infrastructure

Budget chapter and item:	**1601 687 04**
Eligible expenditures 2019:	**€4.2 million**
GHG emission reduction:	**N/A**
Other indicators:	**50 projects**
	70 events
	35 project publications
Funding share:	**N/A**
Assumptions and limitations: --	
Links: New and ongoing projects (programme period 2016-2024): www.exportinitiative-umweltschutz.de Evaluation of the funding programme (2016-2019): https://www.exportinitiative-umweltschutz.de/de/exportinitiative-umwelttechnologien/evaluation-der-exportinitiative-umwelttechnologien	

Since 2016, the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) has been supporting German green tech companies, including SMEs, in the internationalisation of their "green" innovations, products and services with its "Export Initiative Environmental Technologies" (EXI for short) funding programme.

Modern, efficient and resource-saving technologies are not only drivers of growth and innovation – they also contribute to raising environmental standards, disseminating environmental knowledge and thus sustainably improving ecological foundations and local living conditions. In addition, changing lifestyles and consumption habits contribute to increasing prosperity (addressing SDGs), and raising awareness of German environmental technologies and know-how promotes Germany's position as a competent development partner (building trust).

A programme evaluation (2016-2019) concludes, among other things, that EXI makes an important contribution to creating the necessary conditions for the use of innovative environmental technologies and services in the selected target regions:

> *"In this way, the programme works towards sustainable development and an improvement in living conditions in these countries. At the same time, the programme paves the way for German suppliers to tap into those export potentials that result in the target countries from the implementation of the technological solution approaches addressed by the EXI projects.*
>
> *In the federal funding context, EXI forges a link between the field of development cooperation and classic export promotion. The programme is therefore unique."*[22]

According to the funding guideline of 21 May 2019, this expenditure will finance around 50 (collaborative) projects in the BMU fields of action:

- Circular economy,
- Water/wastewater management,
- Innovative cross-sectional technologies and
- sustainable mobility, sustainable urban and regional development, sustainable consumption.

Around 70 events and 35 project publications reach decision-makers and other relevant stakeholders (the number varies depending on the event format). The following success factors and impact potentials (in addition to measurable or quantifiable indicators) can be named:

[22] Cf. p. 5 of the abridged version of the report: https://www.exportinitiative-umweltschutz.de/de/exportinitiative-umwelttechnologien/evaluation-der-exportinitiative-umwelttechnologien (accessed on 07 February 2022).

- Positioning Germany as a preferred development partner in the target countries by building trust: Door-opener function, multipliability → other countries, regions, locations, companies etc. Reputation/"seal of approval", official character;
- Triggering sustainable systemic and structural developments in the target countries, e.g. with regard to legislation or the implementation of norms and environmental standards, which in turn can result in German export opportunities;
- Improving the level of information and knowledge of relevant target groups in order to bring about investment decisions based on increased knowledge and learning effects;
- Market analyses, feasibility studies, data availability, contact initiation, strategy formation;
- Networking as well as technological and economic synergy effects: joint appearance, increased impact, etc.; integration of renowned partners;
- Generating diffusion/imitation effects with a broad impact, for example from implemented pilot/model projects within the target countries (including the multiplicability of developed solutions to other countries).

Concrete examples of EXI projects are:

- DIHK project folder on 20 AHK projects (https://www.exportinitiative-umweltschutz.de/de/mediathek/publikationen/projektmappe-der-dihk-zur-exportinitiative-umwelttechnologien)
- Blue Planet – Berlin Water Dialogues (https://www.exportinitiative-umweltschutz.de/de/projekte/blue-planet)
- Global Survey SDGs (https://www.exportinitiative-umweltschutz.de/de/projekte/marktstudie)

As the programme only started in 2016, it is still too early as of 2019 to expect any export successes by German suppliers resulting directly from the EXI projects. But the results of the external programme evaluation suggest that,

- based solely on the information provided by a few project leaders who felt able to estimate export potentials for German suppliers of innovative environmental technologies and services in the target regions, it could be concluded that the costs for the programme had already been exceeded many times over;
- if only a fraction of this potential could actually be tapped in the medium term, the economic effects (especially export sales) would exceed the amount of funding;
- in addition, there would be non-quantifiable effects, i.e. above all transnational networking effects (which go as far as the formation of strategic cooperation and development partnerships) as well as
- effects of capacity building (resulting from the development of knowledge, skills, structures, etc.) and
- impact contributions of the programme to overarching political objectives with reference to the German sustainability strategy with regard to the promotion of international knowledge transfer (especially in the technical field) and the economical and efficient use of resources. According to the external evaluators, other relevant areas of impact are combating climate change and promoting innovation.[23]

Back to the overview

[23] Cf.: https://www.exportinitiative-umweltschutz.de/de/exportinitiative-umwelttechnologien/evaluation-der-exportinitiative-umwelttechnologien (accessed on 23 August 2022).

3. Research, innovation and awareness raising

The eligible expenditures of the “Research, innovation and awareness raising” sector includes projects that are designed 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, to promote sustainable mobility, the sustainable development of cities and regions, and to promote a circular economy.

The sustainability effects of research and development projects are not directly quantifiable or scalable for the entire sector, especially since the utilisation of research results is uncertain at the time of expenditure. Where possible, however, expected quantitative impacts are given, or at least the number of funding recipients and/or the number of funded projects. In addition, objectives and impacts are described for project examples in the budget items, which should make the sustainability of research expenditures in the precompetitive area transparent.

The eligible expenditures of the sector in the amount of €625.1 million are distributed over 11 budget items.

Note: Research programmes were also assigned to other sectors – in accordance with the Green bond framework – especially if there is a clear connection to a specific sector.

3.1.1. Bioeconomy

Budget chapter and item:	**3004 683 30**
Eligible expenditures 2019:	**€132.3 million**
GHG emission reduction:	**N/A**
Other indicators:	**560 beneficiaries**
	1,372 projects
Funding share:	**33%**
	As a rule, the project duration is 3 years, therefore the funding share is stated as 33%. Third-party financing is not taken into account.
Assumptions and limitations: --	
Links: https://www.bmbf.de/bmbf/de/forschung/energiewende-und-nachhaltiges-wirtschaften/biooekonomie/biooekonomie_node.html Brochure "Tools of the Bioeconomy": https://www.bmbf.de/SharedDocs/Publikationen/de/bmbf/pdf/die-werkzeuge-der-biooekonomie.pdf;jsessionid=FC72FA6BF8028E32A697A2A457842B77.live092?__blob=publicationFile&v=2 Brochure "Bioeconomy in Germany": https://www.bmbf.de/SharedDocs/Publikationen/de/bmbf/7/30936_Biooekonomie_in_Deutschland.html National Bioeconomy Strategy: https://www.bmbf.de/bmbf/shareddocs/pressemitteilungen/de/nationale-biooekonomiestrategi-entierte-und-starke-wirtschaft.html;jsessionid=FC72FA6BF8028E32A697A2A457842B77.live092	

In the field of bioeconomic research, a large number of projects are being funded that deal, for example, with sustainable agriculture of the future, innovative crop cultivation and the transition to a circular economy, especially for a more efficient use of biogenic resources for all areas of application and economic sectors.

Potentials lie in: substitution of fossil raw materials with renewable raw materials as well as co-products and waste products; cascade use of substances and materials; reduction of the use of inputs generated on the basis of fossil raw materials (e.g. fertilisers); adaptation of crops to climate change; increase in sustainability in plant production; development of more sustainable biotechnological procedures and processes. The above-mentioned potentials are illustrated below with project examples.

A monitoring system that will enable the status quo as well as the recording of developments and potentials is being developed.

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

In the *PHAtex* project, researchers are developing novel, biodegradable polyhydroxyal calcanoate (PHA) textiles. As a sustainable alternative, bioplastics could help to reduce plastic waste in the sea and soil. To this end, regionally available, cost-effective biogenic raw materials and residues are to be used as a source of carbon material. This will result not only in the creation of a competitive green biotechnological process chain, but also a cost-effective recycling process without toxic chemicals.[24]

Cascade use of substances and materials

Various regions are being promoted that are developing models for sustainable, bioeconomic value creation. Substances and materials are to be reused and recycled. New raw materials are created from

[24] https://www.tu.berlin/bioprocess/einrichtungen/arbeitsgruppen/smart-bioproduction-grids/phatex/

biogenic residues and waste. In the *BioBall* innovation area in the Frankfurt/Rhine-Main metropolitan region, researchers from science and community enterprises have joined forces for this purpose. In the *SynBioTech* project, they are developing processes to produce products for animal feed and the chemical industry from CO_2. The project contributes to sustainability in two ways: residual materials are used and the use of fossil raw materials in the chemical industry is reduced.[25]

Reduction in the use of inputs generated on the basis of fossil raw materials (e.g. fertilisers)

The sustainable organisation of agricultural production is a central task on the path to a climate neutral bioeconomy. This also involves reducing the use of raw materials and using them in cycles. Researchers in the *SUSKULT* project are developing a cycle-based production system for food. The plants grow in an indoor cultivation system in the city. The resources needed for this – nitrogen, phosphorus, potassium, CO_2 as well as heat and water – come directly from the sewage treatment plant. This saves transport routes and enables local, sustainable agricultural operations. In addition, *SUSKULT* opens up new perspectives: sewage treatment plants could not only produce clean drinking water, but also become a nutrient supplier for agricultural production.[26]

Adaptation of crops to climate change

Rice is one of the most important staple foods worldwide. However, environmental and climate changes are endangering rice cultivation among other places in Vietnam's Mekong Delta as a result of soil salinisation and drought. Researchers in the *RiSaWa* project are therefore looking for options for action for sustainable water use. The goal is to provide sustainable water management for sustainable agricultural rice production.[27]

Increasing sustainability in crop production

In addition to production yields, sustainable agriculture must also conserve resources and meet environmental and climate protection goals. In the *DAKIS* research project, researchers are focusing on digitalisation and field robotics in agriculture. The aim is to integrate ecosystem services, biodiversity and resource efficiency into modern planning processes as well as into production and marketing. A digital development system collects data on soil and plant condition, but also on societal needs and economic factors. In this way, ecosystem services can be optimally provided.[28]

Development of more sustainable biotechnological methods and processes

In the *ContiBio-Elect* project, partners from research and industry are developing a bioreactor in which bacteria produce the important platform chemical acetoin. The new feature is that the bacteria sit on an electrode and release energy to it during production. This means that potentially higher yields can be achieved than in the conventional process. In addition, electricity is generated. If the researchers are successful, the new process will open up access to many oxygen sensitive chemicals that cannot be produced with current biotechnological processes. In the future, chemicals for pharmaceuticals, cosmetics or food could be produced using sustainable biotechnological processes.[29]

Back to the overview

[25] https://biooekonomie-metropolregion.de/bioball/de/innovations_de/synbiotech_de.html

[26] https://www.agrarsysteme-der-zukunft.de/konsortien/suskult and https://suskult.de/

[27] https://www.pflanzenforschung.de/de/forschung-plant-2030/projekte/312/detail

[28] https://www.agrarsysteme-der-zukunft.de/konsortien/dakis

[29] https://biooekonomie.de/foerderung/foerderbeispiele/hohe-leistung-ohne-sauerstoff

3.1.2. Energy technologies and efficient use of energy – R&D projects

Budget chapter and item:	**3004 685 41**
Eligible expenditures 2019:	**€112.1 million**
GHG emission reduction:	**N/A**
Other indicators:	**677 projects**
Funding share:	**33%**
	As a rule, the project duration is 3 years, therefore the funding share is stated as 33%. Third-party financing is not taken into account.
Assumptions and limitations: --	
Links: cf. designation of the programmes in the list	

Energy research, which is also partly funded by the federal government's energy research programme, is aimed at building a sustainable energy system in Germany. Key areas here are energy technologies, efficient energy use, green hydrogen, electricity grids and storage, industrial processes and sector coupling. The eligible expenditures of the budget item are distributed among the following programmes:

Name of the programmes (Click on the project name to visit the website)	Eligible expenditures (in € million)	Number of beneficiaries and projects
Copernicus projects	38.4	184 beneficiaries 257 projects
Carbon2Chem	13.6	13 beneficiaries 26 projects
Energy materials	10.3	76 beneficiaries 105 projects
Solar building	10.1	55 beneficiaries 57 projects
Synthetic fuels	3.6	37 beneficiaries 37 projects
Energy storage development	3.8	21 beneficiaries 22 projects
International partnerships	6.2	52 beneficiaries 71 projects
Cross-sectional tasks	23.7	80 beneficiaries 100 projects
iNew Immediate Coal Programme	2.4	2 beneficiaries 2 projects

Copernicus projects for the energy transition

The aim of the Copernicus projects is to identify technologies relevant to the implementation of the energy transition and to develop them to the point of large-scale application. The four Copernicus projects provide practical solutions for central challenges of the energy transition. The *ENSURE* project is researching the electricity grid of the future. *SynErgie* examines how industry can flexibly adapt its electricity demand to the electricity supply. *Ariadne* analyses which laws can be used to achieve climate goals. *P2X* develops technologies with which electricity can be converted into higher-value energy sources. In the Copernicus projects, which are scheduled to run for ten years in three phases, 160 partners from science, business and civil society are currently jointly developing climate-friendly solutions for a sustainable energy system from the basics to market maturity.[30]

NAMOSYN: Synthetic fuels

The three-year research initiative NAMOSYN, which has been running since 2019, investigates and evaluates production paths and possible applications for synthetic fuels. Alongside electric motors and fuel cells, synthetic fuels are one of the alternatives for CO_2-free mobility – especially in heavy-duty transport, which is difficult to electrify. Synthetic fuels are almost climate-neutral if they are produced from renewable energies, water and CO_2. More than 30 partners from the automotive, supplier, mineral oil and chemical industries as well as research institutions are involved in NAMOSYN.[31]

Carbon2Chem: CO_2 reduction in industry

In Carbon2Chem, 13 partners from industry and science are working together to use green hydrogen to convert CO_2-containing waste gases from a steelwork into precursors for fertilisers, plastics and fuels. This helps to replace oil or natural gas as a carbon source for the chemical industry and thus reduce industrial CO_2 emissions. Thus, the Carbon2Chem approach could help to make up to 20 million tonnes of the annual CO_2 emissions of the steel industry in Germany economically viable. In addition, the concept can potentially be transferred to more than 50 steel locations worldwide as well as other industrial sectors.[32]

Back to the overview

30 https://www.kopernikus-projekte.de/

31 https://namosyn.de

32 https://www.fona.de/de/massnahmen/foerdermassnahmen/carbon2chem.php

3.1.3. Environmental technologies and resources

Budget chapter and item:	**3004 685 42**
Eligible expenditures 2019:	**€108.8 million**
GHG emission reduction:	**N/A**
Other indicators:	**1,635 beneficiaries**
Funding share:	**33%**
	As a rule, the project duration is 3 years, therefore the funding share is stated as 33%. Third-party financing is not taken into account.
Assumptions and limitations: --	
Links: cf. designation of the programmes in the list	

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

Name of the programmes (Click on the project name to visit the website)	Eligible expenditures (in € million)	Number of beneficiaries
Environmental technologies and raw material efficiency	53.0	618
Sustainable water management	44.2	785
Sustainable land management	11.6	232

Resource-efficient Circular Economy – Innovative Product Cycles (ReziProK)

The funding measure "Resource-efficient circular economy – Innovative product cycles (ReziProK)" supports 25 collaborative projects that use innovative business models in conjunction with digital technologies and eco-efficient product design to increase the lifespan and intensity of use of consumer goods and thus keep the value of these goods or the raw materials they contain in the economic cycle for longer. The circular economy thus protects the climate and decouples economic growth from resource consumption. The *Di-Link* project, for example, aims to produce high-quality products from recycled plastics, avoid plastic waste and close material cycles. Currently, large quantities of secondary plastics – recyclates – cannot be processed at all or only into low-quality products. Information deficits in the market with regard to the quality and availability of recyclates are a main reason for this. The sensor technologies further developed in *Di-Link* and the digital solutions tailored to them will collect the data required for this and enable its dissemination and processing. In this way, a more resource-efficient model of plastics use can be established.[33]

Innovative technology for resource efficiency (r4) – Raw materials for future technologies

The globally increasing demand for raw materials for the energy transition can – in addition to the increasing importance of recycling – only be met through the exploration and development of new raw material deposits. Large-scale geophysical surveys that explore raw material deposits at great depths in a sustainable, resource- and energy-efficient manner are therefore an important prerequisite for the raw

[33] https://innovative-produktkreislaeufe.de/Projekte

material extraction of the future. In the r4 project *DESMEX II,* highly innovative technologies are being developed for electromagnetic deep sounding, with which exploration depths of over 1000m can be achieved for the first time worldwide. Helicopters and drones are used to carry out the measurements from the air. Helicopter measurements are planned for sites in the Harz Mountains (Upper Harz deposit area) and in Eastern Bavaria (graphite deposits) as well as in Scandinavia. Drone flights are carried out at known deposits in the Iberian pyrite belt and in Namibia.[34]

CO_2 as a sustainable carbon source – ways to industrial use (CO_2 -WIN)

In order to achieve the German climate goals, a fundamental transformation of the energy and raw material supply will be necessary. This transformation requires the industrial recycling of carbon through the use of CO_2 in order to be able to cover the demand for carbon from non-fossil sources. In the *CO_2 - WIN* funding measure, a total of 15 collaborative projects are being supported in developing CO_2 as a carbon source for sustainable industry. These include collaborative projects of varying development maturity and, among others, the *HTCoEl* project – Compact Synthesis gas generation through high-temperature co-electrolysis. In a highly effective process, CO_2 is converted with water vapour into synthesis gas, which serves as a central feedstock for many processes in the chemical industry and can be used multifunctionally. For example, synthetic fuels or green chemicals such as methanol can be produced from synthesis gas.[35]

Sustainable increase in water availability through innovative technologies, operating concepts and management concepts for water reuse and desalination

An ever-increasing global challenge is the rising consumption of water in the face of limited or even declining resources. The aim of two funding measures is therefore to develop innovative technologies, operational concepts and management strategies for water reuse and desalination in order to sustainably increase water availability.[36]

GRoW: Global Resource Water

12 collaborative projects with a total of 90 sub-projects were launched under the *Global Resource Water – GroW* funding measure to develop both new management strategies and tools for the implementation of the UN Sustainable Development Goals (especially SDG6). Examples include better forecasting of drought and flood events over the next 6 months or high-resolution analysis of global drought risks and vulnerabilities (*GlobeDrought* project).[37]

Innovative Municipalities – Supporting municipalities in the provision of services of general interest

With the project "*Kommunaler Innenentwicklungsfonds*" (municipal inner development fund, KIF) within the framework of *Kommunen innovativ* (Innovative Municipalities), a voluntary and self-managed fund model was developed, from whose resources the internal development of the participating municipalities can be jointly financed. The municipal inner development fund thus enables integrated development according to the principle of "inner before outer development" – not through strict regulation, but through incentives and increased inter-municipal cooperation. To this end, the 47 participating municipalities in the districts of Nienburg/Weser and Gifhorn and their scientific partners first tested the legal, financial and organisational prerequisites for setting up such a fund, defined concrete framework conditions and finally developed the KIF.[38]

Urban-Rural-Plus – Strengthening relations between city and countryside

The aim of the *Urban-Rural-Plus* funding measure is the sustainable development of regions throughout Germany. *The RAMONA* joint project has set itself the goal of defusing the tension between agricultural production, nature and recreation areas and development areas for urban uses. This is to be achieved

[34] https://www.uni-muenster.de/DESMEX/startseite.html

[35] https://co2-utilization.net/de/projekte/co2-als-baustein-fuer-chemische-grundstoffe/htcoei/

[36] https://bmbf-wave.de/Fördermaßnahmen/Hintergrund_+goals+and+theme+fields.html

[37] https://www.bmbf-grow.de

[38] https://kommunen-innovativ.de/kif

through forward-looking, integrative planning and better cooperation between all those involved. *RAMONA* focuses on impact regulation and the special protection of species – both instruments of nature conservation law that serve the goal of preventing or compensating for damage to nature and landscapes caused by construction activities. *RAMONA* brings together partners from administration, business, civil society and research to look for innovative approaches beyond the everyday constraints of facts and actions. The aim is to find ways to make compensation measures more spatially comprehensive, more networked and thus more effective.[39]

Geosciences / Underground geosystems

In the thematic focus "Underground Geosystems", studies of basic processes in the scientific context of technologies such as deep and near-surface geothermal energy, heat storage in deep and near-surface geosystems are the subject of the research projects. Research activities focus on the development of conventional and unconventional hydrocarbon reservoirs or the deep underground storage of gases or fluids.[40]

CLIENT II – International partnerships for sustainable innovation

CLIENT II focuses on promoting demand-oriented research and development cooperation with partners in selected emerging and developing countries in the areas of raw material efficiency, water management and natural hazards, among others. The aim is to develop and jointly implement innovative and sustainable solutions for concrete challenges in the partner country in the areas of climate, environment, resources and energy. Globally, *CLIENT II* thus makes a direct contribution to the reduction of environmental damage, the restoration of already damaged environmental functions and the sustainable use of natural resources.[41]

Back to the overview

[39] https://www.zukunftsstadt-stadtlandplus.de

[40] https://www.fona.de/de/massnahmen/foerdermassnahmen/nutzung-unterirdischer-geosysteme.php

[41] https://www.bmbf-client.de/projekte

3.1.4. Climate research, biodiversity and globalised habitats – R&D projects

Budget chapter and item:	**3004 685 40**
Eligible expenditures 2019:	**€91.6 million**
GHG emission reduction:	**N/A**
Other indicators:	**486 beneficiaries**
	1,024 projects
Funding share:	**33%**
	As a rule, the project duration is 3 years, therefore the funding share is stated as 33%. Third-party financing is not taken into account.
Assumptions and limitations: --	
Links: see programmes and examples	

With the research areas “Climate Research”, “Biodiversity and Ecosystems” and “Globalised Habitats”, research funding addresses central challenges of global change. Research and development projects create a knowledge base and develop and test concrete options for action. The funding thus makes important contributions to the implementation of the BMBF framework programme “Research for Sustainable Development (FONA3)”, in particular the flagship initiatives “City of the Future”, “Green Economy” and the new research initiative on the conservation of biodiversity.

Essential programme areas are presented below. Examples are then described.

Name of the programmes (Click on the project name to visit the website)	Eligible expenditures (in € million)	Number of beneficiaries and projects
Research for climate change mitigation and regional adaptation, climate modelling and prediction, extreme events, economics of climate change, centres of excellence for climate change and adapted land use in Southern and Western Africa, among others.	58.0	299 beneficiaries 663 projects
Flagship initiative City of the Future, urban climate and sustainable urban development, sustainable land management, etc.	18.6	116 beneficiaries 229 projects

Climate research

To improve the planning basis for climate adaptation measures, extreme events are to be better recorded, modelled and evaluated. Existing gaps in knowledge about future cloud formation and the expected intensity of precipitation will be closed. This serves to develop an even more powerful climate model system with high temporal and spatial resolution.

In the programme on the economics of climate change, practicable suggestions for solutions for feasible transformation paths towards a carbon-neutral society are developed. The effectiveness of climate policy instruments and an efficient policy mix are analysed and knowledge is created on how to deal with climate risks and successfully shape international climate policy.

Biodiversity and ecosystems

In order to understand the causes of the decline in biodiversity, essential foundations for understanding the processes in ecosystems and knowledge of biodiversity and its functional properties are being researched. Participatory, application-oriented research results in products and options for action for the sustainable use and conservation of biodiversity and ecosystems. In research on sustainable land use, strategies and implementation paths for climate adaptation are developed with local and regional decision-makers.

City of the Future

The funding measure “Urban Climate in Transition” contributes to adapting cities to climate change and making them more liveable through the development of a practical urban climate tool. Among other things, it can map the effect of concrete planning measures on the microclimate in the city and facilitate concrete planning decisions in the future. The funding measure “Climate resilience through action in cities and regions” focuses on the development and testing of concrete options for action and processes as well as new technologies for adapting to climate change. In an international context, the research priority “Sustainable Development of Urban Regions” is dedicated to integrated urban planning, reduction of greenhouse gas and pollutant emissions and better risk management of extreme weather events and natural disasters in the priority region of Asia.

International climate partnerships

Education and research are the basis for growth, prosperity and social participation. Regional partnerships and platforms with developing and emerging countries enable the development of needs-based scientific structures and regional education and research capacities to mitigate environmental risks. In order to better understand the consequences of climate change in Africa in particular and to minimise the risks, research, academic training and the development of practical climate services on climate change and adapted land use in Africa have been expanded.

Back to the overview

3.1.5. Coastal, marine and polar research, geoscience research – R&D projects

Budget chapter and item:	**3004 685 44**
Eligible expenditures 2019:	**€55.7 million**
GHG emission reduction:	**N/A**
Other indicators:	**169 beneficiaries**
	345 projects
Funding share:	**33%**
	As a rule, the project duration is 3 years, therefore the funding share is stated as 33%. Third-party financing is not taken into account.
Assumptions and limitations: --	
Links: https://www.fona.de/de/themen/meeres-und-polarforschung.php	

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

Name of the programmes (Click on the project name to visit the website)	Eligible expenditures (in € million)	Number of beneficiaries and projects
Coastal research (KüNo, KFKI)	2.8	28 beneficiaries 64 projects
Marine research (incl. operation of research vessels)	33.4	32 beneficiaries 92 projects
Polar research (Pekris, GROCE)	1.4	9 beneficiaries 12 projects
Scientific and technical cooperation (including Israel, Southern Africa, China, Central Asia, Great Britain)	7.8	32 beneficiaries 79 projects
EU (JPIO – Mining Impact, Microplastic; BONUS)	3.0	23 beneficiaries 34 projects
Earth Sciences (incl. CLIENT II)	7.3	45 beneficiaries 64 projects

Marine, coastal and polar research – R&D projects

The challenge is to protect the ecosystems of the coasts, seas and polar regions and to secure the use of their resources and ecosystem services for present and future generations. Research must clarify the conditions and processes of change, derive forecasts and thus provide the basis for decisions on adaptation measures and environmentally friendly forms of use and economy. In this sense, the *MARE-N* programme initiates comprehensive preventive research that is future-oriented and innovative.[42]

Coastal research (KüNO, KFKI)

The North Sea and Baltic Sea are subject to climate change and are under increasing pressure of use. In addition, reactions to changes in the catchment area are taking effect in the coastal ecosystems. The KüNO research programme promotes transdisciplinary research for the conservation of coastal ecosystems and their ecosystem services, for integrated coastal protection and for sustainable

[42] https://www.fona.de/de/themen/meeres-und-polarforschung.php

management of coastal zones. The aim is to improve the scientific basis for ecosystem-oriented, sustainable management of coastal resources and to make its results available to practice-oriented users.[43]

Marine research (incl. operation of research vessels)

Alongside the atmosphere, the oceans are the driving force behind climate processes and the Earth's material balance. Climate research is inconceivable without efficient marine and polar research. For example, climate history can be reconstructed from ice cores from the large ice sheets of our planet with the help of polar research. In order to protect the coasts from storm surges and the dangers posed by rising sea levels, the physical, chemical and biological relationships in the world's oceans must be understood. The German research ships are on the oceans and in the polar regions in the service of research and are an important part of international scientific cooperation.[44]

Polar research (Pekris, GROCE)

Nowhere else is climate change as visible as in the polar regions. Global warming is causing the ice of the Arctic and Antarctic to melt at record speed. The consequences of this for the material and energy flows of the polar regions and how these influence the marine communities are being researched, e.g. on the basis of data from the MOSAIC expedition. The results form the basis for the IPCC reports, for example.[45]

Scientific and Technical Cooperation (STC) with Israel, Southern Africa, China, Central Asia, United Kingdom

The main goals of scientific and technological cooperation are participation in international research programmes to solve global problems, the expansion and improvement of bilateral relations and access to interesting research regions. In addition, the cooperation aims at political stabilisation and reconstruction aid as well as technology export and market development, especially for small and medium-sized enterprises.[46]

EU (JPIO – Mining Impact, Microplastic; BONUS)

The federal government has committed itself at European and international level to meeting the global challenges of environmental and climate protection and has adopted a strategy for the internationalisation of science, research and development. Through "JPI - Oceans - The Joint Programming Initiative Healthy and Productive Seas and Oceans", intergovernmental European activities for the protection of seas and oceans are bundled and coordinated. The member countries pursue the goal of defining joint long-term, strategic priorities for marine research and technology development in the marine sector in Europe and of setting joint priorities in further scientific and technological development through targeted measures. For example, the priority "Mining Impact" aims at implementing future measures for the protection of marine ecosystems in marine mining. The priority area "Microplastics" addresses the environmental problem of plastics, especially microplastic particles in the marine environment. The relevant sources of microplastics are being researched and analytical methods for identifying microplastics are being developed and uniform monitoring is being created throughout Europe.[47]

Earth Sciences (incl. CLIENT II)

CLIENT II focuses on promoting demand-oriented research and development cooperation with partners in selected emerging and developing countries. The aim is to develop and implement innovative and sustainable solutions for concrete challenges, e.g. in the area of natural risks in the partner country. The use of the geological subsurface as an economic area, e.g. for transport routes, storage of energy in connection with the energy transition, requires research and the implementation of innovative monitoring procedures.[48] Back to the overview

43 https://www.ptj.de/projektfoerderung/mare-n/kuestenmeerforschung

44 https://www.ptj.de/meeresforschung

45 https://www.ptj.de/meeresforschung

46 https://www.ptj.de/wtz

47 https://www.jpi-oceans.eu/

48 https://www.ptj.de/projektfoerderung/geo-n and https://www.ptj.de/projektfoerderung/fona/client_ii

3.1.6. Research, studies, etc.

Budget chapters and items:	**1601 544 01 and 1604 544 01**
Eligible expenditures 2019:	**€50.1 million and €13.4 million**
GHG emission reduction:	**N/A**
Other indicators:	**170 newly committed projects in 2019**
	658 funded projects in 2019
	and
	43 newly committed projects in 2019
	211 funded projects in 2019
Funding share:	**N/A**
Assumptions and limitations: --	
Links: Ministerial Research Plan Report: https://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Forschung/ressortforschungsplan_gesamt_2019_bf.pdf Final reports of all research projects can be found at: https://www.bmu.de/ministerium/foerderung-und-forschung/forschung/forschungs-und-entwicklungsberichte.	

Environmental policy action, the development of strategies and concepts, but also the assessment of environmental impacts and material risks as well as the observation of social, economic and technological trends require a solid science-based decision-making basis. Environmental regulations must be reviewed and further developed, and ongoing environmental programmes and concepts must be accompanied by research. The research of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety makes a significant contribution to this as a bridge between science and politics. It is fundamentally geared towards supporting the fulfilment of the tasks of the Ministry and its higher federal authorities.
The ministerial research included in the Green German Federal securities is divided into the areas of **environmental and climate protection** (**1601** 544 01) and **nature conservation (1604** 544 01**).**

The eligible expenditures of the budget item Environment and Climate Protection (1601 544 01) are distributed across the following twelve programme areas. Essential areas are described below. Further descriptions of the research areas can be found in the linked annual BMU research report.

Name of the programmes	Number of new commitments in 2019	Number of projects funded 2019 total
Climate protection	16	57
Adaptation to the impacts of climate change	11	31
International environmental protection – in particular further development of the climate regime	7	22
Resource efficiency / circular economy	14	85
Environment and economy, sustainable product and consumer policy	13	68
Groundwater, water, soil and marine protection	12	56
Air pollution control/ Environmentally friendly technologies/ Noise protection/ Environmental requirements for the transport turnaround	22	77

Name of the programmes	Number of new commitments in 2019	Number of projects funded 2019 total
Environment and health	22	89
“Material risks“	19	64
Urban environmental protection – sustainable land management	7	34
Environmental aspects of the energy transition	7	17
Cooperation with social groups/cooperation partners and overarching environmental policy issues	20	58

Short descriptions of essential programmes:

Climate protection

In the area of climate protection research, innovative climate finance instruments are developed, among other things. In addition, the implementation of measures in the energy sector and various policy areas are examined from a climate protection perspective (e.g. structural policy, agricultural policy). In addition, knowledge of the effects of non-CO_2 greenhouse gases and their alternatives on ecosystems is investigated.

Adaptation to climate change

Research in the field of climate adaptation is intended to contribute to increasing the climate resilience of our society. In particular, management instruments for mitigating climate risks in the state and the economy are being investigated and adaptation measures derived. This applies in particular to the areas of soil biology and unsealing, as well as flood protection and heavy rainfall prevention, but also low water risk management.

Resource efficiency / circular economy

The BMU’s research in the field of resource efficiency contributes to the transition to a circular economy. This research includes the development of instruments to strengthen the recycling of building products and the use of recyclates in building products, the development of strategies for the recycling of plastics containing fibres, the development of concepts for waste prevention and the management of individual waste streams, and technology transfer.

Environment and economy, sustainable product and consumer policy

Environmental and climate protection policy instruments also have an impact on the economy and consumers. For this reason, the BMU is investigating measures for the ecological further development of the social market economy. This includes, in particular, the identification and evaluation of environmentally harmful subsidies and the development of environmental policy control instruments as economic incentives to increase environmental innovations. In addition, strategies and instruments for the efficient export and transfer of environmental technologies and environmental innovations abroad (including the Environmental Technologies Export Initiative) are being investigated. Moreover, knowledge transfer is contributed to, e.g. through the preparation of practical aids for the implementation of the European environmental management system EMAS, for concepts of sustainable management (CSR) and environmental and sustainability reporting in companies, municipalities and other organisations.

The eligible expenditures of the budget item Nature Conservation (1604 544 01) is 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 BMU research report.

Name of the programmes	Number of new commitments in 2019	Number of projects funded 2019 total
Questions of principle in nature conservation policy	3	23
Methods and instruments for the protection and sustainable use of nature and biodiversity	11	57
National and international species protection	2	33
National and international protection of ecosystems and habitats	4	14
Integration of nature and biodiversity into other policy areas	8	34
Nature conservation and society	4	9
Accompanying research on nature conservation Energy transition	11	41

Short descriptions of essential programmes:

Questions of principle in nature conservation policy

Within the framework of research on fundamental issues of nature conservation policy, the implementation of the National Strategy on Biological Diversity is supported, among other things. In addition, the economic value of ecosystems, ecosystem services and biodiversity are examined and a link is established with environmental economic accounting. In this way, the value of nature is also to be taken into account in value creation. Furthermore, international bodies such as the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) are supported.

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

The area of method development is particularly concerned with the development and testing of additional components of comprehensive biodiversity monitoring. In addition, landscape planning instruments and FFH impact assessments are being further developed and concepts for “green infrastructure” are being operationalised. As well as environmentally compatible use in floodplains, water-meadows and peatlands, instruments for the recording, protection and development of urban nature are also being developed.

National and international species protection

In the area of national and international species conservation, the BMU’s research focuses on insect populations and occurrences, the causes of insect extinction and insect conservation measures. In the international field, it also contributes to the further development of the instruments for implementing the Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and to EU dossiers, e.g. on dealing with invasive species.

Back to the overview

3.1.7. Social sciences for sustainability

Budget chapter and item:	**3004 685 43**
Eligible expenditures 2019:	**€33.5 million**
GHG emission reduction:	**N/A**
Other indicators:	**284 beneficiaries**
	284 projects
Funding share:	**33%**
	As a rule, the project duration is 3 years, therefore the funding share is stated as 33%. Third-party financing is not taken into account.
Assumptions and limitations: --	
Links: https://www.fona.de/de/themen/gesellschaft-sozial-oekologische-forschung.php	

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

Designation of the programmes or examples in the budget item	Eligible expenditures (in € million)	Number of beneficiaries and projects
Systemic approaches for sustainable urban mobility	4.0	42 beneficiaries 42 projects
Social-ecological junior research groups	4.9	30 beneficiaries 30 projects
Social-ecological research and economics	24.6	212 beneficiaries 212 projects

Mobility

The *QuartierMobil* research project aimed to develop new mobility offers as well as urban planning measures that meet the mobility needs of citizens as well as climate and sustainability goals. In two real labs – one in an existing neighbourhood (Frankfurt Bornheim) and the other in a newly built neighbourhood (Darmstadt Lincoln-Siedlung) – municipal decision-makers, mobility service providers, civil society and scientists came together to develop strategies for the future of urban mobility. Since completion of the project, the approximately 1,000 residents of the Lincoln-Siedlung in Darmstadt currently have a variety of services at their disposal to help them do without their private cars, such as car and bike sharing offers, e-car pooling vehicles, free e-cargobike rental and a free and individual consultation ("MobiCheck") on their own mobility behaviour. This locally adapted mobility concept is currently being transferred to other cities and made permanent. The city of Darmstadt was awarded the German Mobility Prize 2019 for this transdisciplinary mobility concept developed for the Lincoln-Siedlung.[49]

[49] https://www.fona.de/de/massnahmen/foerdermassnahmen/leitinitiative-zukunftsstadt.php

Biodiversity

The project *How much is the dish? – Measures to increase biodiversity through true cost accounting for food (HoMaBiLe)* of the measure "Valuing and safeguarding biodiversity in politics, the economy and society (*BiodiWert*)" aims to determine the environmental costs of various food products in order to use them as a basis for determining the "true" retail prices. The analysis of ecological indicators along the agricultural value chain is used to determine the impact of food production on biodiversity. The negative impacts of climate gases (CO_2, nitrous oxide and methane), reactive nitrogen, energy consumption and land use changes on biodiversity are considered. Through a subsequent economic evaluation of the indicators, the "true prices" are determined and the possible losses of biodiversity through the production of food are mapped in monetary terms. The determined "true prices", which would have to be 62% higher on average for the selected products, were presented to the public in a supermarket run by one of the partners in the project. An acceptance analysis is used to determine how consumers react to the internalisation of environmental costs, among other things to identify social hurdles to implementation and to shed light on the social compatibility of possible political measures. Based on the research results, recommendations for policy measures to include biodiversity losses from agricultural production in food prices will be formulated in order to transform food production and consumption in a biodiversity-promoting way. Furthermore, the appreciation of biodiversity in society is increased through target group-oriented discussion and communication offers.[50]

Back to the overview

[50] https://www.fona.de/de/massnahmen/foerdermassnahmen/Wertschaetzung-und-Sicherung-von-Biodiversitaet.php

3.1.8. Investments to mitigate pollution (Environmental Innovation Programme pilot projects)

Budget chapter and item:	**1601 892 01**
Eligible expenditures 2019:	**€14.8 million**
GHG emission reduction:	**N/A**
Other indicators:	**Quantitative impact for 9 selected example projects**
Funding share:	**N/A**
Assumptions and limitations: --	
Links: https://www.umweltinnovationsprogramm.de	

The Environmental Innovation Programme finances pilot projects focusing on technologies and processes to prevent and reduce environmental pollution as well as on the production and application of environmentally friendly products and alternative materials. Initiatives and organisations with a focus on environmental protection and nature conservation are also supported with federal grants.

Quantitative impact indicators are available for the following 9 example projects (approx. 43% of eligible expenditures).

Designation of the examples (Click on the project name to visit the website)	Eligible expenditures (in € million)	Reduction of GHG emissions (in t CO_2-e p.a.)	Other indicators
Recycling of waste polyolefins	2.0	90,240	Energy saving effects of 450MWh per year (Note on GHG reduction: 90,000t p.a. through replacement and 240t p.a. through energy savings).
Construction of a sulphur combustion plant for the CO_2 -free production of process steam and the optimal supply of raw materials.	1.0	3,400	--
Phosphorus recovery from sewage sludge ash at the Hamburg sewage treatment plant using the TetraPhos® process	1.0	--	About 1,600t of phosphorus recovered annually
Conserving resources by increasing sorting efficiency in the processing of packaging waste mixtures	0.6	8,500	Recycling rate increased from 40% to 52.2%, 3,600t of mono films sorted out and 14,400t of MPOflex produced
Resource-saving process for the production of bioplastics	0.6	746	Water consumption reduced by approx. 70 to 80%, approx. 93MWh energy saved, approx. 62t gas saved
Process combination of catalytic denitrification, thermal flue gas post-combustion and the energetic-material utilisation of biological waste sludge for the reduction of emissions with simultaneous energetic optimisation of clinker production in a cement plant	0.5	28,200	Raw material savings: 18,480t per year
Energy-intelligent wastewater treatment plant Schwarzenbruck	0.4	300	Energy savings of 100% of the previous electricity consumption - (653MWh)

Designation of the examples (Click on the project name to visit the website)	Eligible expenditures (in € million)	Reduction of GHG emissions (in t CO_2-e p.a.)	Other indicators
Process water after-treatment plant for the production of soluble coffee	0.2	10,500	95% fewer substances that are difficult to break down are added to the public sewage system.
Large-scale project to demonstrate the technical and economic use of low-temperature heat from geothermal energy (60°C) for further CO_2 neutral heating and hot water production in a residential area currently supplied with high-temperature heat.	0.1	1,260	Energy losses can be reduced and the previously fossil-based heat supply can be converted to renewable energies

Back to the overview

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

Budget chapter and item:	**1601 685 04**
Eligible expenditures 2019:	**€10.1 million**
GHG emission reduction:	**N/A**
Other indicators:	**N/A**
Funding share:	**N/A**
Assumptions and limitations: Heterogeneity of the funded programmes does not allow for aggregation.	
Links: --	

This budget item serves to promote associations and ranges from support for standardisation activities in the field of air pollution control to hazard assessment of chemicals to general support for environmental associations through their umbrella organisation, the German League for Nature and Environment (Deutscher Naturschutzring, DNR).

The eligible expenditures of the budget item are mainly distributed among the following programme areas. Representative examples are described below.

Name of the programmes	Eligible expenditures (in € million)	Other indicators
German League for Nature and Environment (DNR)	1.9	
Support for standardisation activities	1.7	
Projects to identify and assess chemicals in need of regulation	0.3	4 associations (BUND, DNR, Pestizid Aktions Netzwerk, WECF) 3 projects
Environmental protection and nature conservation projects by associations	4.5	
Association of German Engineers (VDI) for the Commission “Clean Air in the VDI and DIN”.	1.4	

Project: Health Care Without Harm Europe (HCWH) “Combating the emergence of antimicrobial resistance (AMR) and its release into the environment”.[51]

The aim of the project is to minimise the release of pharmaceuticals into the environment and to reduce the spread of antimicrobial resistance (AMR). In particular, it aims to support the development of an improved EU strategy for reducing pollution from pharmaceuticals. This includes concrete actions to limit human medicine residues in the environment and the spread of AMR.

[51] https://www.umweltbundesamt.de/das-uba/was-wir-tun/foerdern-beraten/verbaendefoerderung/projektfoerderungen-projekttraeger/bekaempfung-der-entstehung-von-antimikrobieller

NEuropa – Niche Innovations for the Transformation of the German Food System (NAHhaft e.V.)
In the field of research, NAHhaft initiates and accompanies inter- and transdisciplinary research projects. One focus here is on improving urban food governance for the transformation of regional food systems.
This also applies to the field of advisory services, in which NAHhaft advises municipalities and cities on how to align, coordinate and sustainably shape their food policy activities together with civil society and economic actors. The results of the funding project were:

- Various factsheets in German, English, Spanish
- Publication of the collection of profiles of 22 niches in German and English in the UBA Texte series
- Publication of the interactive FoodSy map with over 40 niches (from both the NEuropa and the TransfErn projects)

White Goods Reuse – Increasing the reuse of large household appliances in Germany and breaking new ground in the collection of large household appliances with new business models between retailers and workshops in cooperation with the manufacturer (ReUse e.V.)[52]
The project has designed a scalable take-back and remarketing system and tested it in pilot implementations. Unused potential was identified through an integrated view of the value chain and initial business models for the individual actors were defined.
The environmental impact is calculated and compared on the basis of the different business models in order to obtain robust statements on reuse.

Back to the overview

[52] https://www.umweltbundesamt.de/das-uba/was-wir-tun/foerdern-beraten/verbaendefoerderung/projektfoerderungen-projekttraeger/weisse-ware-wiederverwenden

3.1.10. Knowledge- and technology transfer tools as part of the High-Tech Strategy

Budget chapter and item:	**3004 683 10**
Eligible expenditures 2019:	**€2.8 million**
GHG emission reduction:	**N/A**
Other indicators:	**26 beneficiaries**
	26 projects
Funding share:	**N/A**
Assumptions and limitations: --	
Links: https://www.forschungscampus.bmbf.de/	

The eligible expenditures of the budget item serve the Flexible Electrical Networks (FEN) research campus. 26 grant recipients were supported with 26 projects. Further impact indicators are not available.

In order to master the energy transition efficiently and sustainably, innovative technologies for future electrical grids with a high proportion of renewable and decentralised energy sources must be researched and developed. The Flexible Electrical Grids (FEN) research campus is taking up this challenge and thus making an important contribution to a sustainable, secure and affordable energy supply. The transdisciplinary research focuses on the development and integration of DC voltage technology. In addition to technological issues, questions of social acceptance as well as biological, ecological, urban planning and economic aspects are taken into account.[53]

Back to the overview

[53] https://www.forschungscampus.bmbf.de/forschungscampi/fen

4. Energy and industry

In order to achieve the climate protection goals, Germany is implementing the energy transition. The energy and industry sector covers measures to accelerate the transition to an economy largely based on renewable energies and to an environmentally efficient consumption of energy and resources. Energy and industry are responsible for the majority of Germany's total emissions:

- The industrial sector was responsible for around 24% of total emissions in 2020. This corresponds to 178 million tonnes of CO_2 equivalents. Industrial emissions fell significantly in 2020. Compared to the previous year, 5% or 9 million tonnes of CO_2 equivalents less greenhouse gases were emitted by industry. The main reason for this was a decrease in production volumes due to the coronavirus pandemic.[54]
- The energy industry is responsible for the largest share of emissions in Germany, at 30%. In 2020, its greenhouse gas emissions amounted to 221 million tonnes of CO_2 equivalents. The greenhouse gas emissions of the energy industry fell sharply in 2020. Compared to the previous year, the sector's emissions fell by 38 million tonnes of CO_2 equivalents; this corresponds to a reduction of 15%. The significant drop in energy demand as a result of the coronavirus pandemic had a major effect.[55]
- The building sector had a 16% share of total direct emissions in Germany in 2020. Emissions from the sector fell by just under 3% from 2019 to 2020 to 120 million tonnes of CO_2 equivalents. One reason is the increased renovation activities and the increasing use of renewable heating technologies.[56]

Renewable energies are being expanded steadily and reliably. Energy efficiency is being improved in the energy industry as well as in the building sector and in energy-intensive industry. The generation of energy through nuclear energy and coal will be phased out step by step in Germany.

The main instrument for funding in this area is the Energy and Climate Fund (EKF). The programmes financed by the EKF play a central role in implementing the energy transition and achieving national and international climate targets.[57]

The eligible expenditures of the sector in the amount of €1,198.5 million are distributed across 9 budget items in the areas of

- Energy research (1 budget item with €512 million in eligible expenditures),
- Renewable energy (2 budget items with €292.6 million in eligible expenditures),
- Energy efficiency (4 budget items with €236.7 million in eligible expenditures) and
- National Climate Initiative (2 budget items with €157.2 million in eligible expenditures).

For 7 budget items of the sector, the impacts are quantifiable, including avoided GHG emissions, but also energy savings or energy provided. In addition, targets and impacts are described qualitatively for project examples of selected budget items.

54 Cf. p. 14 Climate Action Report 2021

55 Cf. p. 11f Climate Action Report 2021

56 Cf. p. 16 Climate Action Report 2021

57 In addition, there are extensive promotional programmes for energy-efficient building refurbishment by KfW, which are taken into account for KfW green bonds. Furthermore, measures envisaged with the German Reconstruction and Resilience Plan (DARP) for the EU Commission's European Reconstruction Instrument "Next Generation EU" were excluded as eligible expenses for Green German Federal securities.

4.1. Energy research

4.1.1. Energy research

Budget chapter and item:	**0903 683 01**
Eligible expenditures 2019:	**€512.0 million**
GHG emission reduction:	**N/A**
Other indicators:	**4,300 ongoing projects**
Funding share:	**73%**
Assumptions and limitations: The projects running in 2019 had an average funding rate of 73%, i.e. 73% of the total of all project costs was borne by the federal government, the rest by the companies.	
Links: Federal Report Energy Research 2020: https://www.bmwk.de/Redaktion/EN/Publikationen/Energie/federal-government-report-on-energy-research-2020.html	

The Federal Energy Research Report 2020 transparently presents the goals and measures of energy research for the reporting period 2019.[58] Note: The Federal Energy Research Report also contains projects whose expenditures are not eligible for Green securities. Project profiles for ten examples of eligible expenditures can be found in the Federal Energy Research Report 2020:

Example	Report page	Project name (further details directly in the report)	Funding funds approach total (in € million; perennial)	Identifier
1	22	EG2050: Urban Solar Decathlon	12.2	03EGB0019
2	27	Solar fuels – Solar fuels for the energy mix of the future	1.3	03EIV221
3	30	HJT4.0 – Next generation manufacturing and process techno lo gies for heterojunction solar cells and modules for Industry 4.0	9.2	0324172A-D, F, G
4	31	CIGS façade – Façade-integrated photovoltaic systems in CIGS technology	1.0	0324156A-C
5	37	QEWS II – Quality assurance for borehole heat exchangers II with participation in IEA-ECES-Annex 27	4.0	03ET1386A-G
6	44	Future Energy Solutions (FES) – Development of a cost effective mass energy storage system for renewable energies	10.7	03ET6072A-C
7	48	ORBIT – Optimisation of a trickle bed bioreactor for the dynamic microbial biosynthesis of Methane with archaea in power-to-gas plants	0.9	03ET6125A-F
8	48	innoKA – Material Innovations for the Polymer-electrolyte fuel cell	1.8	03ET6096A-E
9	50	FlexEuro – Economic optimisation of flexible electricity-intensive industrial processes	1.7	03EI1003A-D
10	53	ACT ALIGN-CCUS – Acceleration of the waxing process low-carbon technologies through $CCUS_2$	5.3	0324186A, B, D-G

Back to the overview

[58] https://www.bmwi.de/Redaktion/DE/Publikationen/Energie/bundesbericht-energieforschung-2020.html

4.2. Renewable energy

4.2.1. Market Incentive Programme for the Use of Renewable energy in the Heat Market and Energy efficiency incentive programme

Budget chapter and item:	**6092 686 04 and 6092 686 11**
Eligible expenditures 2019:	**€245.4 million and €16.2 million**
GHG emission reduction:	**0.278 million t CO_2-e p.a.**
Other indicators:	**331,944MWh p.a. final energy savings**
	266,667MWh primary energy savings
	57,088 beneficiaries
	937MW installed capacity
	1,364,900MWh energy supply (final energy)
Funding share:	**N/A**
Assumptions and limitations: The data on savings and activity size refer to the installations for which funding was paid out in 2019. The actual implementation of the measures may deviate in time. For a detailed description of the assumptions/methodology, please refer to the evaluation report. Indicators according to NAPE reporting	
Links: https://www.bmwi.de/Redaktion/DE/Evaluationen/Foerdermassnahmen/evaluation-marktanreizprogramms-2019.pdf?__blob=publicationFile&v=8 NAPE methodology: https://www.bmwi.de/Redaktion/DE/Publikationen/Studien/endenergieeinsparziel-abschaetzungder-durch-politische-massnahmen-erreichbarenenergieeinsparungen.pdf	

In order to achieve a nearly climate-neutral building stock, a variety of efforts are necessary. 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. Therefore, solar collector systems, solid biomass combustion systems, efficient heat pumps, deep geothermal systems and particularly innovative technologies for heating and cooling are promoted.

Back to the overview

4.2.2. Energy transition programmes and measures in the areas of renewable energy sources, electricity and power grids, digitalisation and energy infrastructure

Budget chapter and item:	**6092 686 13**
Eligible expenditures 2019:	**€47.3 million**
GHG emission reduction:	**N/A**
Other indicators:	**199 beneficiaries**
Funding share:	**N/A**
Assumptions and limitations: This is a multi-year project (duration: 2016 to 2021). The beneficiaries have received funding over several years.	
Links: https://www.sinteg.de/ergebnisse/uebersicht	

In the funding programme "Smart Energy Showcases – Digital Agenda for the Energy Transition" (SINTEG), model regions are to develop solutions for a climate-friendly, efficient and secure energy supply with high shares of renewable energy, and demonstrate them on a large scale. Quantitative impact indicators are not available. Therefore, targets and examples are described below.

The following goals are to be achieved:

- Efficient and safe grid operation with high shares of renewable energies,
- Increase efficiency and flexibility potentials (market and grid side),
- Efficient and secure interaction of all actors in the smart energy grid and
- More efficient use of the existing network structure.

Among other things, safe, efficient processes suitable for mass business, system management concepts, innovative technologies as well as market mechanisms for flexible and smart grids and markets must be developed. The programme thus also addresses digitalisation as an important building block for achieving energy policy goals. It contributes to supporting German companies in the development and deployment of innovative solutions for modernising the grid infrastructure, improving their competitiveness on the global market and securing jobs. SINTEG is the largest model project for the energy transition in Europe and an important stimulus for the changing energy and ICT sector in Germany as a centre of innovation. More than 200 actors from the energy and ICT sectors (especially companies, but also research institutions and associations/municipalities) are involved in the five showcases regions. Numerous associated partners without state funding are also involved in the model regions.

Examples of solutions:

1. The grid operators currently already have various means of regulatory congestion management at their disposal in the form of redispatch (section 13 and 13a of the Energy Industry Act (EnWG)), the curtailment of conventional plants (section 13 of the EnWG) and feed-in management (section 14 and 15 of the Renewable Energy Act (EEG) 2017). The implementation of the NABEG 2.0 by October 2021 will combine these mechanisms and transfer them to Redispatch 2.0.

   Existing or future regulatory mechanisms will be supplemented by the introduction of flex platforms with a market-organised mechanism that can open up further flexibilities for congestion management. Since regulatory and market mechanisms can be used simultaneously, coordination of the mechanisms is then necessary. The aim of combining regulatory and market congestion management is to eliminate congestion as cost-effectively as possible. This means that from both mechanisms, those measures must be selected which are associated with the lowest costs relative to their effectiveness on the congestion.
2. Flex platforms offer the possibility to tap heterogeneous and small-scale flexibility potentials for congestion management. Therefore, a digital infrastructure is needed that can network a large number of actors and map complex coordination processes with numerous information and message types between these actors. The infrastructure must be able to combine and process large heterogeneous amounts of data. In this way, extensive automation and efficient system and flex

platform operation can be achieved. The established ICT systems of the network operators based on proprietary interfaces can only partially fulfil these requirements so far.

3. In SINTEG, various solutions for data and service platforms were demonstrated that enable cross-actor information exchange, integrate heterogeneous data sources, connect diverse actors and at the same time can offer data-based services. These data and service platforms can be used to map the functions of the flex platforms and provide the information relevant for the operation of the flex platforms.

   A large part of the balancing power is currently still provided by conventional power plants. However, with the transformation of the energy system, decentralised plants will have to play a central role in the provision of balancing power in the future. Despite the adjustments made in recent years to the prequalification conditions and the tender design for balancing power in favour of decentralised plants, the high technical requirements, regulatory hurdles and lack of economic incentives pose a challenge to the development of further flexibilities for the balancing power market. This hinders the development of further decentralised plants and new technologies for the provision of balancing power.

   The solutions tested in SINTEG were able to show that in the future control power can be provided by decentralised plants that currently do not contribute to the control power provision or only to a very small extent. For example, the technical capability of a pool of wind power plants to provide minute reserve and secondary control power was demonstrated. Furthermore, it was demonstrated how the integration of technologies that are already established in the balancing power market, such as lithium-ion battery storage, can be used in a plant pool to increase the balancing power potential of additional decentralised plants.

4. Qualitative surveys within the framework of SINTEG have shown that citizens would like to get more personally involved in the energy transition, including financially. It is therefore particularly relevant to show what needs to be done for the successful implementation of the energy transition and who can participate in concrete ways.

   In order to get more people involved in the energy transition, citizens must first be made aware of the fact that they are already an essential part of the energy transition or that they can be in the future. The participation approaches tested within the framework of SINTEG offer concrete examples of how to address citizens directly in the context of the energy transition. The examples of solutions presented should therefore serve as suggestions or starting points for further comparable systematised participation formats in different contexts and be developed further. In this context, the concrete measures for “active participation” are highly dependent on the respective local situation, the existing digital infrastructure and, in particular, the political framework conditions, which have a decisive influence on the possibilities for end users to get involved.

5. The energy transition remains an area that is strongly driven by technical issues, and accordingly, it is primarily technicians who determine the nature of the dialogue. However, successful implementation of the coming phase of the energy transition requires both broad societal support and increasingly (pro-) active participation of all citizens. Accordingly, there is an increased need for further measures to win citizens over again and again for active participation in the energy transition. With advancing digitalisation and the need for permanent dynamic adjustments in the energy system of the future, there will also be significantly more opportunities for participation, but also an increased need for end consumers. This rapidly advancing change requires both constant adaptation to the latest technologies and further development of the associated participation opportunities. The more complex the underlying energy system becomes, the greater the need for explanation for end consumers and the need for targeted involvement increases accordingly. In order to communicate the more complex contents of the energy transition to the general public, a stronger and early involvement of communication experts (possibly supplemented by marketing specialists) is recommended.

Back to the overview

4.3. Energy efficiency

4.3.1. Energy efficiency in industry and businesses

Budget chapter and item:	**6092 686 08**
Eligible expenditures 2019:	**€133.2 million**
GHG emission reduction:	**1.0 million t CO_2-e p.a.**
Other indicators:	**7,224 beneficiaries**
Funding share:	**N/A**
Assumptions and limitations: The estimate for 2020 is based on the 2019 evaluation report. The savings determined in the evaluation report refer to the approved funding volume and calculate the savings annually from the start of the approval over the entire life of the measure.	
Links: --	

In order to achieve the goals of the energy transition for the purpose of a comprehensive and far-reaching transformation of the energy supply and energy use in Germany, the federal government supports investment measures in plant and process modernisation with the funding programmes "Energy Efficiency in Industry – Grant and Loan" and "BMWi Energy Efficiency Competition".

The aim is to promote the efficient use of resources and accelerate the market penetration of highly efficient technologies in the industrial and commercial sectors.

The aim of the funding programmes is to increase energy efficiency through investments in the economy and to expand the share of renewable energies for the provision of process heat.

In addition to other measures, the energy transition also focuses on reducing energy consumption by increasing energy efficiency.

Energy Efficiency in the Economy – Grant and Loan

The investment programme "Energy Efficiency in the Economy – Grant and Loan" optimises the existing offer to promote energy efficiency in industry and commerce in a user-friendly way. This is intended to promote the investments required to achieve the climate protection and energy efficiency goals for the reduction of greenhouse gases in a more cost-efficient and effective manner.

In particular, investments in more complex and more systemic energy-related optimisations of production processes are to be promoted more effectively. This is intended to reduce energy consumption and CO_2 emissions and contribute to increasing the competitiveness of the supported enterprises. The special concerns of small and medium-sized enterprises are taken into account.

Subjects of funding are:

1. Cross-sectional technologies

Funding is provided for individual investment measures to increase the energy efficiency of industrial and commercial facilities and processes through the use of highly efficient technologies available on the market.

Eligible investments are one or more investments for the replacement or new acquisition of high-efficiency systems or aggregates for industrial and commercial use within the following technology criteria:

- 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

2. Process heat from renewable energies

Funding is available for measures to provide process heat from:

- Solar collector systems
- Biomass plants
- Heat pumps

3. Measurement and control technology, sensor technology and energy management software

Eligible for funding are:

- The acquisition and installation of measurement and control technology and sensor technology for monitoring and efficient control of energy flows for integration into an energy or environmental management system or, for small and medium-sized enterprises, into an alternative system in accordance with the Peak Efficiency System Ordinance.
- The purchase and installation of energy management software as well as the training of personnel by third parties in the use of the software, insofar as they are directly related to plants and processes.

4. Energy-related optimisation of plants and processes

Funding is provided for investment measures to optimise the energy efficiency of industrial and commercial facilities and processes that contribute to increasing energy efficiency or reducing fossil energy consumption in companies.

BMWi Energy Efficiency Competition

The “BMWi Energy Efficiency Competition” is a measure that is essentially open to all actors, sectors and technologies. It is a further development of and successor to the funding programme “Promotion of electricity savings within the framework of competitive tenders: Exploiting electricity efficiency potential – STEP up!”, which was introduced in 2016.

Funding is provided in a competitive procedure for the implementation of energy efficiency projects in companies. It is essentially open to all actors, sectors and technologies.

This is intended to reduce primary energy consumption and CO_2 emissions, strengthen the competitiveness of companies and support the dissemination of high-efficiency technologies.

Funding is available for investment measures to optimise the energy efficiency of industrial and commercial facilities and processes that contribute to increasing energy efficiency or reducing fossil energy consumption in companies.

The central criterion for the funding decision is the CO_2 savings 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 and approved taking into account the funds available per competition round. If the funding efficiency is the same, the project with the higher absolute CO_2 savings is given preference.

Back to the overview

4.3.2. Providing advice on energy efficiency

Budget chapter and item:	**6092 686 14**
Eligible expenditures 2019:	**€54.3 million**
GHG emission reduction:	**0.507 million t CO_2-e p.a.**
Other indicators:	**2,888,889MWh energy savings**
	158,089 beneficiaries
Funding share:	**N/A**
Assumptions and limitations: Evaluation of energy advice to private consumers, for residential buildings, non-residential buildings, installations and systems.	
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/SharedDocs/Kurzmeldungen/DE/Energie/20181214_Evaluierung_EBM_EBK.html	

The federal government promotes advisory services on energy consumption and corresponding measures for all end users, such as private households, small and medium-sized enterprises and public authorities. Advice is provided on topics such as increasing energy efficiency and the use of renewable energies (e.g. energy saving, insulation, modern heating technology) or optimising heating systems.

Federal funding for independent energy advice for private consumers in the advice centres of the consumer advice centres (stationary advice)

The energy advice service of the consumer centres offers the largest unbiased advisory service on the subject of energy in Germany. Since 1978, it has been supporting private households with currently around 600 energy advisors at around 900 locations (nationwide coverage of Germany). In 2019, around 113,000 households received independent and neutral advice on energy efficiency in buildings, including electricity saving, thermal insulation, modern heating technology and renewable energies. New in 2019 were webinars for private consumers.

Federal funding for energy and electricity savings checks for private households – Energy Checks

In addition to the stationary advice, energy advisors have been coming to consumers' homes since 2011 in order to better address specific situations on site (building, system technology, equipment, lighting) and the needs of the consumers. In 2019, so-called energy checks were carried out in around 30,000 households on site. The focus of the energy checks was on building checks, with around 12,000 cases.

Federal funding for energy advice for residential buildings (on-site advice, individual renovation roadmap) (EBW)

The funding is aimed at owners of residential buildings (private house or flat owners, housing associations and condominium owners' associations – WEG). A qualified energy consultant approved by the Federal Office of Economics and Export Control (BAFA) examines the entire property and prepares a comprehensive energy consulting report (including an individual renovation roadmap – iSFP). In addition to energy-saving potentials, the report also assesses possible uses for renewable energies and the necessary investments, and shows the savings in heating costs and CO_2. Energy advice thus helps to include energy efficiency and renewable energies in the planning and decision-making process and thus to exploit the efficiency potential at the most favourable time for the individual. Building owners are thus better informed about the added value of energy modernisation measures and receive a sound basis for decision-making. It is also taken into account that energy modernisation is most cost-effective if it can be coupled with upcoming maintenance or modernisation measures (use of synergies). In 2019, around 10,500 consultations took place.

Federal funding for energy consulting for non-residential buildings of municipalities and non-profit organisations (EBK)

The funding programme provides financial support for advice on energy-efficient refurbishment and new construction of public facilities, e.g. schools, kindergartens or administrative buildings. The aim is to reduce the investment backlog in these buildings and to support municipalities in setting an example for the public sector. Funding is provided for energy consulting for the development of an energy refurbishment concept or refurbishment roadmap for non-residential buildings (for, among other things, coordinated individual measures or for a comprehensive refurbishment) or an energy-efficient new building (non-residential buildings) such as town halls or schools. In 2019, a total of around 700 consultations were carried out.

Federal funding for energy consulting in small and medium-sized enterprises (EBM)

As part of the federal funding for energy consulting in small and medium-sized enterprises (EBM), renovation concepts for buildings, facilities and processes of small and medium-sized enterprises are funded. In this context, energy weaknesses in the company are examined and a company inspection is carried out. Approximately 3,700 consultations took place in 2019. An in-depth energy analysis (energy audit) is carried out in accordance with DIN EN 16247-1, which contains clear information on potential savings and a concrete action plan.

Back to the overview

4.3.3. Heating optimisation programme

Budget chapter and item:	**6092 686 10**
Eligible expenditures 2019:	**€32.9 million**
GHG emission reduction:	**0.014 million t CO_2-e p.a.**
Other indicators:	**49,444MWh p.a. new energy savings in 2019**
	53,240 funding decisions
	78,393 installed systems
Funding share:	**N/A**
Assumptions and limitations: Data from NAPE notification 2019	
Links: NAPE: https://www.bmwk.de/Redaktion/DE/Publikationen/Studien/endenergieeinsparziel-abschaetzung-der-durch-politische-massnahmen-erreichbaren-energieeinsparungen.pdf	

According to the funding guideline that came into force on 1 August 2016, the replacement of heating pumps and hot water circulation pumps with highly efficient pumps (funding criterion 1) and/or the implementation of heating optimisation through hydraulic balancing of heating systems and supplementary measures (funding criterion 2) that have been installed for more than two years at the time of implementation of the measure are funded. Both funding conditions can be combined with each other. In 2019, a total of around 53,300 approvals were granted.

Back to the overview

4.4. National Climate Initiative

4.4.1. National Climate Initiative

Budget chapters and items:	**6092 686 05 and 1602 686 05**
Eligible expenditures 2019:	**€119.6 million and €37.5 million**
GHG emission reduction:	**3.57 million t CO_2-e over the entire impact period***
Other indicators:	**1,032 employees direct**
	1,801 employees indirect
Funding share:	**N/A**
Assumptions and limitations: Evaluation report determines CO_2 savings only in total for the years 2018 and 2019. The share for 2019 is estimated approximately from the ratio of subsidies.	
Links: Evaluation report 2018 and 2019: https://www.klimaschutz.de/zahlen-und-fakten	

The National Climate Initiative (NKI) was founded in 2008 to significantly enhance climate protection measures in all relevant target groups, i.e. municipalities, businesses, private households and in the field of education. To achieves these goals, the NKI promotes both informational and investment projects for greenhouse gas reduction. The initiative covers a wide range of climate protection activities, from the development of long-term strategies to specific support and financing measures in the energy sector, transport and business/industry, which are intended to contribute to the reduction of greenhouse gas emissions.[59] Moreover, it supports the development and implementation of innovative approaches to climate protection together with citizens and stakeholders from society, business and science.

*In the evaluation period 2018 to 2019, more than 6,900 projects with a funding volume of €331.1 million were funded and 7.6 million t CO_2-e savings (net) over the entire impact period were achieved. The funding share in 2019 is around 47%.

Examples of informational projects:

Energy Savings Check "municipal" (€2.6 million in eligible expenditures): advice for 113,085 households, exchange of 12,399 refrigerators for class A+++ appliances; CO_2 reduction over lifetime through immediate assistance and change of behaviour: 159,123t CO_2-e; CO_2 reduction through refrigerator exchange: 16,112t CO_2-e (=total 0.175 million t CO_2-e) in the funding period 2016 – 2019. The funding share for 2019 is approx. 8.3%.

Energy Savings Check (€7.3 million eligible expenditures); advice for 64,000 households and exchange of 5,200 refrigerators; CO_2 reduction of approx. 90,000t CO_2-e over lifetime in the funding period 2019 - 2022. The funding share for 2019 is approx. 27%.

Examples of investment projects:

Bike lanes in the city of Offenbach (A+B)[60] : By 2021, 9km of bicycle lanes and six axes for bike traffic were created, providing new access to the city area and the surrounding countryside. The new paths are designed in an eye-catching way to ensure safety for all generations and to facilitate orientation. No through traffic is allowed on the bike lanes, a maximum speed limit of 30km/h applies to everyone, and cyclists are allowed to ride side by side.

Back to the overview

[59] For individual programmes, see also 9th FCWI Report p. 30ff.: https://www.bundesfinanzministerium.de/Content/DE/Standardartikel/Themen/Oeffentliche_Finanzen/Bundeshaushalt/Energie-und-Klimafond/2020-04-27-EKF-Bericht-2020.html

[60] https://www.offenbach.de/bikeoffenbach/

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 impacts of climate change and to protect natural resources, ecosystems and biodiversity. In addition, the sector also plays a central role in climate change mitigation.

With 66 million tonnes of CO_2 equivalents, the agricultural sector accounted for 9% of total German emissions in 2020. Compared to the previous year, agricultural emissions fell by around 2%.[61] 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 (sink) and through wood products. Overall, the LULUCF sector acts as a sink for carbon dioxide in Germany. The difference between released and sequestered greenhouse gases results in the emissions balance in the LULUCF sector. In 2020, the emissions balance of the LULUCF sector was minus 16.5 million t CO_2 equivalents.[62]

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 and climate goals.

The eligible expenditures of the sector, totalling €381.5 million, are distributed across 14 budget items in the areas of

- Sustainable agriculture and forestry (9 budget items with €129.7 million in eligible expenditures),
- Coastal defences and flood protection (4 budget items with €240.7 million in eligible expenditures) and
- Protection of ecosystems (1 budget item with €11.1 million in eligible expenditures).

61 Cf. p. 15 Climate Action Report 2021

62 Cf. p. 19 Climate Action Report 2021

5.1. Sustainable agriculture and forestry

5.1.1. Funding of innovation in the area of food, agriculture and health-related consumer protection

Budget chapters and items:	**1005 686 31 and 1005 893 31**
Eligible expenditures 2019:	**€45.4 million**
GHG emission reduction:	**N/A**
Other indicators:	**756 projects**
Funding share:	**N/A**
Assumptions and limitations: --	
Links: https://www.ble.de/DE/Projektfoerderung/Foerderungen-Auftraege/Innovationen/Programm-BMEL/programm-bmel_node.html	

The aim of the programme is to support technical and non-technical innovations in Germany. Funding is provided for projects in thematic areas such as agricultural engineering, plant breeding, plant protection, livestock breeding, husbandry and health, food safety and quality, nutrition, food production as well as aquaculture and fisheries.

For research and development projects where the utilisation of the results is only in the future after the end of the project, a quantification, e.g. of a CO_2 reduction potential, is not possible. Potentials lie in:

- Increasing sustainability in crop and livestock production and production in urban areas
- 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 (e.g. reduction in peat use; fertilisers, plant protection products (e.g. non-chemical PPPs), plastic packaging).
- Ensuring sustainable nutrition of farm animals under changing climatic conditions
- Efficiency increase and input reduction through digitalisation and AI in production and the value chain
- Reduction of emissions in animal husbandry

For the eligible expenditures of the budget items, the following programmes can be reported as examples:

Name of the programmes	Eligible expenditures (in € million)	Number of projects
Budget item 1005 686 31 – total	**40.6**	**673**
Joint project: Reduction of greenhouse gas emissions in crop production through site-adapted optimised intercropping systems (THG-ZWIFRU)	1.79	7
Joint project: Reduction of ammonia and greenhouse gas emissions and optimisation of nitrogen productivity through innovative techniques of slurry and fermentation-residue application in growing stocks (GuelleBest)	1.6	4
Joint project: Optimised nitrogen fertilisation through multi-parametric data fusion and precise application in real time (FuzzyFarmer)	0.6	5
Joint project: Climate change mitigation-oriented bio-waste utilisation for agriculture (KlimaBioHum)	1.1	3

Name of the programmes	Eligible expenditures (in € million)	Number of projects
Joint project: Development of a retrofit solution for acid application in liquid manure channels of animal houses (SAFT)	0.6	3
Joint project: Efficient slurry treatment reduces ammonia and methane emissions and slurry storage capacities while recycling P (ASAP)	0.5	3
Budget item 1005 893 31 – total	**4.8**	**83**
Joint project: Reduction of GHG emissions and ammonia through optimised N management (GreenWindows4_0)	0.4	2
Joint project: Sustainable increase in phosphate efficiency of winter wheat through effective root-soil interaction (POEWER)	0.8	6

Back to the overview

5.1.2. Subsidies to fund research, development and demonstration projects in the area of renewable resources and to fund national sustainable forestry projects

Budget chapters and items:	**1005 686 11 and 1005 893 11**
Eligible expenditures 2019:	**€43.8 million**
GHG emission reduction:	**N/A**
Other indicators:	**270 beneficiaries**
	559 projects
Funding share:	**N/A**
Assumptions and limitations: --	
Links: Funding programme for renewable raw materials: https://www.fnr.de	

The "Renewable raw materials" funding programme supports research, development and demonstration projects with renewable raw materials. The funding programme pursues a variety of goals, e.g. the efficient and environmentally friendly use of resources, including the avoidance or binding of greenhouse gases and the preservation of biodiversity.

For research and development projects where the utilisation of the results is only in the future after the end of the project, a quantification, e.g. of a CO_2 reduction potential, is not possible.

For the eligible expenditures of the budget items, the following programmes can be reported as examples:

Name of the programmes	Eligible expenditures (in € million)	Number of beneficiaries	Number of projects
Budget item 1005 686 11 – total	**25.5**	**127**	**280**
InsHabNet project	0.5	1	1
TAKOWIND II joint project	0.7	1	1
Budget item 1005 893 11 – total	**18.3**	**143**	**279**
FINAL joint project	0.86	4	4
MOOS BREEDING collaborative project	0.36	4	4
Call for funding "Bio-based lubricants"	1.61	31	8

Back to the overview

5.1.3. Area of renewable raw materials and sustainable forestry

- *Grants to fund forestry measures (excluding investments)*
- *Grants to fund forestry measures (investments)*
- *Grants to combat the consequences of extreme weather events in forests (excluding investments)*
- *Grants to combat the consequences of extreme weather events in forests (investments)*

Budget chapter and items:	**1003 632 41, 1003 882 41, 1003 632 42, 1003 882 42**
Eligible expenditures 2019:	**€28.4 million**
GHG emission reduction:	**N/A**
Other indicators:	**32,376 funding cases**
	7,455ha reforested area (*within the framework of forest conversion of near-natural forest management)*
	137ha of grant-aided area *(for the establishment of cultivation within the framework of initial afforestation (new planting of forest))*
	3,483,854m³ of processed infested wood
Funding share:	**60%** (= funding share of the federal government)
Assumptions and limitations: GAK reporting by the countries, reporting period 2019	
Links: https://bmel-statistik.de/fileadmin/daten/GAB-0002000-2019.pdf https://www.bmel.de/DE/themen/laendliche-regionen/foerderung-des-laendlichen-raumes/gemeinschaftsaufgabe-agrarstruktur-kuestenschutz/gemeinschaftsaufgabe-agrarstr-kuestenschutz_node.html	

The **joint task "Improvement of Agricultural Structure and Coastal Protection" (GAK)** of the federal government and the *Länder* is the most important national funding instrument for efficient, competitive agriculture and forestry geared to future requirements, coastal protection and vibrant rural areas. It contains a wide range of agricultural structure and infrastructure measures and thus largely covers the scope of the European Agricultural Fund for Rural Development (EAFRD).

Details on the principles, objectives and procedural issues are regulated in the law on the joint task "Improvement of the Agricultural Structure and Coastal Protection" (GAK Act – GAKG). To fulfil the joint task, a joint framework plan is drawn up by the federal government and the *Länder* for the period of a four-year financial plan. The GAK framework plan identifies the measures and the objectives associated with them, 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 is valid for the period of the financial planning and is reviewed annually and adapted to current developments. The GAK framework plan 2019-2022 contains 9 funding areas and 3 special framework plans.

The GAK's **funding area 5 "Forestry" supports, among other things,** various measures for **near-natural forest management**, for the **creation of new forests** or for **coping with the consequences of extreme weather eventsin forests** (federal government's share of funding: 60%, *Land's* share of funding: 40%) and is implemented by the *Länder*:

- In "forest conversion" as part of "near-natural forest management", for example, reforestation as well as pre- and sub-planting (including natural regeneration) with site-appropriate tree and shrub species through sowing and planting including cultivation preparation, forest edge design, protection of the cultivation as well as maintenance during the first 5 years are eligible for funding. A sufficient proportion of native tree species must be maintained.

- "Initial afforestation" or "new forest establishment" includes, for example, sowing and planting, in each case including crop preparation, forest edge design and securing the crop during the first 5 years. This also includes surveys, such as site assessments, which serve to prepare the measure.
- Forest protection measures in the context of "Measures to cope with the consequences caused by extreme weather events in forests" include, for example, combating harmful organisms by finding and processing infested wood (e.g. sanitary felling, debarking, disposing of bark, moving and transporting wood) or other measures that reduce the breeding suitability of wood, residual wood or brushwood to such an extent that hazards no longer emanate from this material or do not arise in the first place.[63]

The following exemplary effects can be reported for the above-mentioned promotional measures:

Designation of the funding areas	Eligible expenditures (in € million)	Number of funding cases	Other indicators
Budget items 1003 632 41 and 1005 882 41	**14.1**	**22,253**	
Funding area 5 A	--	--	Reforested *(as part of the forest conversion of near-natural forest management)*: 7,455.39ha
Funding area 5 D	--	--	Subsidised area *(for the establishment of cultivation within the framework of initial afforestation (new planting of forest))*: 136.94ha
Budget items 1003 632 42 and 1003 882 42	**14.3**	**10,123**	
Funding area 5 F	--	--	Processed infested wood: 3,483,854.20m³

Back to the overview

[63] In each case, excerpt from the GAK framework plan 2019

5.1.4. Forest Climate Fund

Budget chapter and item:	**6092 686 06**
Eligible expenditures 2019:	**€12.1 million**
GHG emission reduction:	**N/A**
Other indicators:	**36 approved projects in 2019**
	152 ongoing projects in 2019
Funding share:	**N/A**
Assumptions and limitations: --	
Links: --	

In the 2019 financial year, the BMEL and BMU spent a total of around €12.10 million on the Forest Climate Fund, which is managed jointly. In 2019, 49 new project outlines were submitted. For 13 projects, an invitation to submit an application was issued. In order to increase the number of technically sound outlines, expert discussions were also held and calls for funding were published for a limited period of time. By the end of 2019, a total of 36 projects with a funding volume of around €14.1 million had been approved.

The projects running in 2019 are assigned to the five priority areas defined by the Forest Climate Fund's funding guidelines:

- Adaptation of forests to climate change (1 project),
- Ensuring carbon storage and increasing CO_2 sequestration of forests (1 project),
- Increasing wood product storage, CO_2 reduction and substitution by wood products (19 projects),
- Research and monitoring (95 projects) and
- Information and communication (36 projects)

The Forest Climate Fund is intended to implement measures of special federal interest that serve to adapt forests to climate change and maintain the indispensable contribution of near-natural, structurally and species-rich forests to safeguarding the natural foundations of life in the long term. The positive effects for the development of the CO_2 reduction and energy potential of forests and wood are to be strengthened. A concrete calculation of the GHG savings for the funding used is not possible for these measures, as they are mainly research projects, model, practice-oriented projects and communication projects. However, the fundamental contribution to achieving the objectives and the qualitative assessment of the expected effects is the subject of every application review and will also be the subject of the upcoming evaluation of the Forest Climate Fund.

Example projects are:

Name of the programmes	Eligible expenditures (in € million)	Description
MooreSax acronym – Saxony Forest State Enterprise	0.6	Model project for the creation of forest peatlands with the aim of higher C storage, protection of forests and biodiversity
Acronym BiCO_2 – Nabu Münsterland e.V.	1.2	Research projects to establish a basis for evaluation
Climate change mitigation through small private forests – for owners and society	0.4	Development of options that both sustainably improve the efficiency of timber extraction and serve climate and nature conservation goals. The focus of the investigations is thus the

Name of the programmes	Eligible expenditures (in € million)	Description
		required balance between the interests of society and the concerns of forest owners.
Basics and strategies for the provision of high-quality and adaptable forest reproductive material in climate change;	0.9	The aim of forest plant breeding is to meet the challenges of the steadily increasing demand for wood, the setting aside of part of the managed forest area for conversation purposes (5-10%) and the uncertainties of climate change. Forest plant breeding enables an increase in growth performance, enhanced wood quality and high genetic diversity.
Mixed beech-fir forests for the adaptation of commercial forests to extreme climate change events; Subproject 1	0.3	Research into the optimal tree combination for climate adaptation.

Back to the overview

5.2. Coastal defences and flood protection

5.2.1. Grants to fund flood protection facilities, the renaturation of dykes, torrent control and the renaturation of water bodies

Budget chapter and item:	**1003 882 15**
Eligible expenditures 2019:	**€90.9 million**
GHG emission reduction:	**N/A**
Other indicators:	**1,135 funding cases**
	341,652ha protected area *(through new construction and reinforcement of flood protection structures and torrent protection)*
	32ha retention area gained *(through relocation and deconstruction of dykes)*
	1,979km/2,459ha scope of funding *(within the framework of near-natural watercourse development)*
Funding share:	**60%** (= funding share of the federal government)
Assumptions and limitations: GAK reporting by the countries, reporting period 2019	
Links: https://bmel-statistik.de/fileadmin/daten/GAB-0002000-2019.pdf https://www.bmel.de/DE/themen/laendliche-regionen/foerderung-des-laendlichen-raumes/gemeinschaftsaufgabe-agrarstruktur-kuestenschutz/gemeinschaftsaufgabe-agrarstr-kuestenschutz_node.html	

For general remarks on the **joint task "Improvement of the agricultural structure and coastal protection" (GAK),** see Section 5.1.3 "Area of renewable raw materials and sustainable forestry".

The GAK's funding area 7 "Water management measures" promotes both flood protection measures and measures for near-natural watercourse development (federal government's share of funding: 60%, *Land's* share of funding: 40%) and is implemented by the *Länder*.

Flood protection measures are

- the construction and reinforcement of flood protection facilities,
- the relocation and deconstruction of dykes and
- torrent control systems.

Conceptual preparatory work and surveys in connection with these measures can also be funded.

Measures for near-natural watercourse development should contribute to improving the ecological and chemical status of surface waters in rural areas. This includes the creation of watercourse development areas and the improvement of water retention in the landscape.

The following exemplary effects can be reported for the above-mentioned promotional measures:

Funding area	Number of funding cases	Impact indicators
New construction and reinforcement of flood protection facilities and torrent control structures	645	Protected area: 341,652.47ha
Relocation and dismantling of dykes	1	Retention area gained:32ha
Measures for near-natural watercourse development	489	Scope of funding: 1,979.47km/ 2,459.06ha

Back to the overview

5.2.2. Grants for funding coastal defence measures

Budget chapter and item:	**1003 882 61**
Eligible expenditures 2019:	**€81.2 million**
GHG emission reduction:	**N/A**
Other indicators:	**189 funding cases**
	17,546ha protected area
Funding share:	**70%** (= funding share of the federal government)
Assumptions and limitations: GAK reporting by the countries, reporting period 2019	
Links: https://bmel-statistik.de/fileadmin/daten/GAB-0002000-2019.pdf https://www.bmel.de/DE/themen/laendliche-regionen/foerderung-des-laendlichen-raumes/gemeinschaftsaufgabe-agrarstruktur-kuestenschutz/gemeinschaftsaufgabe-agrarstr-kuestenschutz_node.html	

For general remarks on the **joint task "Improvement of the agricultural structure and coastal protection" (GAK),** see Section 5.1.3 "Area of renewable raw materials and sustainable forestry".

The GAK's **funding area 8 "Coastal protection"** promotes various measures to increase safety on the coasts, on the islands and on the flowing surface waters in the tidal area against flooding and land loss due to storm surges and sea attack (federal government's share of funding: 70%, *Land's* share of funding: 30%). Implementation is carried out by the coastal *Länder*. Eligible for funding are:

- New construction and reinforcement of flood protection structures including dyke defence and drift clearing routes,
- Barrages and other structures in the flood protection line,
- Groynes, breakwaters and other installations in the sea,
- Foreshore works in front of seawalls up to a depth of 400m,
- Sand replenishment,
- Bank protection works.

Conceptual preparatory work and surveys in connection with these measures can also be eligible for funding. Expenditure on nature conservation and landscape management measures to be carried out as a result of coastal protection measures is also eligible for funding.

The following impact can be reported for the above-mentioned promotion measures:

Funding area	Number of funding cases	Protected area (in ha)
New construction and reinforcement of flood protection structures including dyke defence and drift clearing routes including preliminary works and surveys	162	5,145.9
Barrages and other structures in the flood protection line including preliminary works and surveys	12	6,000.0
Foreshore works in front of seawalls up to a depth of 400m including preliminary works and elevations	4	3,000.0
Sand replenishment including preparatory work and surveys	5	2,700.0
Bank protection works including preliminary works and surveys	6	700.0
Total	**189**	**17,545.9**

Back to the overview

5.2.3. Grants for funding preventive flood protection measures

Budget chapter and item:	**1003 882 82**
Eligible expenditures 2019:	**€50.4 million**
GHG emission reduction:	**N/A**
Other indicators:	**15,979ha of reclaimed floodplain area**
	295,000,074m³ of reservoir space gained
Funding share:	**60%** (= funding share of the federal government)
Assumptions and limitations: GAK reporting by the countries, reporting period 2019	
Links: https://www.bmel-statistik.de/fileadmin/daten/GAB-0002000-2019.pdf https://www.bmel.de/DE/themen/laendliche-regionen/foerderung-des-laendlichen-raumes/gemeinschaftsaufgabe-agrarstruktur-kuestenschutz/gemeinschaftsaufgabe-agrarstr-kuestenschutz_node.html	

For general remarks on the **joint task "Improvement of the agricultural structure and coastal protection" (GAK),** see Section 5.1.3 "Area of renewable raw materials and sustainable forestry".

In order to strengthen the support of urgent investment measures within the framework of preventive flood protection, additional investment funds are made available to the *Länder* under the GAK's **special framework plan "Measures for Preventive Flood Protection",** subject to the availability of federal budget funds. Eligible for funding are:

- the deconstruction 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;
- preliminary conceptual work and surveys related to the aforementioned measures;
- the one-off payment for the creation of a right of use in rem, which is necessary in the context of flood protection, amounting to up to 20% of the market value of the land area or part of the land area affected by the flood protection measure;
- the one-off payment for the acquisition of ownership of a plot of land or part of a plot of land necessary for flood protection.

For the eligible expenditure of the budget item, the following programmes can be reported as examples:

The dismantling of dykes to improve flood protection, in particular to reclaim floodplains, has reclaimed almost 16,000ha of floodplains.

Measures to gain retention areas, such as the creation of flood retention basins and polders, have created more than 295 million m³ of storage space.

Back to the overview

5.2.4. Grants to fund coastal defence measures against the effects of climate change

Budget chapter and item:	**1003 882 81**
Eligible expenditures 2019:	**€18.2 million**
GHG emission reduction:	**N/A**
Other indicators:	**50 funding cases**
	97,105ha protected area
Funding share:	**70%** (= funding share of the federal government)
Assumptions and limitations: GAK reporting by the countries, reporting period 2019	
Links: https://www.bmel-statistik.de/fileadmin/daten/GAB-0002000-2019.pdf https://www.bmel.de/DE/themen/laendliche-regionen/foerderung-des-laendlichen-raumes/gemeinschaftsaufgabe-agrarstruktur-kuestenschutz/gemeinschaftsaufgabe-agrarstr-kuestenschutz_node.html	

For general remarks on the **joint task "Improvement of the agricultural structure and coastal protection" (GAK),** see Section 5.1.3 "Area of renewable raw materials and sustainable forestry".

Due to emerging climate change, sea levels are rising more strongly than previously predicted. This must be taken into account when dimensioning coastal protection structures. Planned or new coastal protection measures must be implemented more quickly.
The funds earmarked for coastal protection under the regular GAK framework plan are not sufficient for this purpose. In order to meet the additional funding requirements for these urgent measures, the coastal states of Schleswig-Holstein, Hamburg, Lower Saxony, Bremen and Mecklenburg-Western Pomerania will be provided with additional funds under the GAK's **special framework plan "Coastal protection measures as a result of climate change".** Funding for coastal protection measures under this special framework plan is provided in accordance with the principles for funding coastal protection measures under the regular framework plan (see comments on 5.2.2 "Allocations for funding coastal protection measures").

The following exemplary effects can be reported for the above-mentioned promotional measures:

Funding area	Number of funding cases	Protected area (in ha)
New construction and reinforcement of flood protection structures including dyke defence and drift clearing routes	49	96,804.9
Bank protection works	1	300.0
Total	**50**	**97,104.9**

Back to the overview

5.3. Protection of ecosystems

5.3.1. Grants for the establishment and long-term protection of areas of nature and landscapes of national importance (chance.natur)

Budget chapter and item:	**1604 882 01**
Eligible expenditures 2019:	**€11.1 million**
GHG emission reduction:	**N/A**
Other indicators:	**455,000ha project area**
	15 projects
Funding share:	**6.1%**
	(in relation to the total volume of projects incl. grants of third parties)
Assumptions and limitations: Impact after full realisation of the projects	
Links: https://www.bmu.de/themen/naturschutz-artenvielfalt/naturschutz-biologische-vielfalt/foerderprogramme/chancenatur-bundesfoerderung-naturschutz	

The federal government is involved in various programmes to conserve biological diversity and protect endangered species. The “chance.natur” programme promotes the establishment and safeguarding of areas of nature and landscapes worthy of protection and of nationally representative importance. It makes an important contribution to the protection of biological diversity and natural heritage.

The projects protect species such as the kingfisher, black stork, red kite, lesser spotted eagle, grey woodpecker, woodlark, brook lamprey, bullhead, hazel grouse, lynx, wildcat, endangered fruit species, pale and dark anteater, wall lizard, yellow-bellied toad and stone crayfish, dark meadow anteater, sainfoin, red-winged snare shrike, high moorland yellowfinch, high moorland bluefinch, Arctic emerald dragonfly, adder, dwarf birch, thread-rooted sedge and blueberry willow.

225 Red List species and 36 threatened plant communities occur in individual project areas.

The five largest projects of the budget item in 2019 are:

Project name	Eligible expenditures (in € million)	Funding share of Green German Federal securities 2020 (in %)[64]	Project area (in ha)	Other indicators
Lower Havel Lowlands (Untere Havelniederung)	2.6	6.5%	9,000	Renaturation of 86km of river course
Siebengebirge – Chance7	1.1	7.1%	11,346	
Hamburg, of course! (Natürlich Hamburg!)	0.8	29.0%	7,000	
Hohe Schrecke	0.7	5.7%	13,440	
North Western Pomerania Forest Landscape (Nordvorpommersche Waldlandschaft)	0.7	7.3%	51,200	

Back to the overview

[64] In relation to the total volume of projects (incl. third-party grants)

III. Acknowledgements

This report was prepared in cooperation with the relevant ministries under the coordination of the Core Green Bond Team of the BMF, BMU and Finance Agency and validated by the Interministerial Working Group.

The core team would like to thank the many colleagues who contributed to the preparation of the report, including from the following ministries:

- Federal Ministry for Economic Affairs and Energy (BMWi)
- Federal Ministry of Food and Agriculture (BMEL)
- Federal Ministry of Transport and Digital Infrastructure (BMVI)
- Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)
- Federal Ministry of Education and Research (BMBF)
- Federal Ministry for Economic Cooperation and Development (BMZ)

The names and responsibilities of the ministries correspond to the structure of the ministries in the 2019 financial year.[65]

Furthermore, thanks are due to the many project promoters, authorities and funding agencies that implement the funding programmes and thus contribute significantly to impact reporting.

[65] Official order according to the announcement of the formation of the government on 14 March 2018 in the Federal Gazette of 16 March 2018: https://www.bundesanzeiger.de/pub/publication/OfWcxTATaMQbtpse55z?0

IV.Glossary

ABS	Extension line
AFID	Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure.
AI	Artificial Intelligence
AMR	Antimicrobial resistance
BAFA	Federal Office of Economics and Export Control
CFC	Chlorofluorocarbons
CO_2	Carbon dioxide
CO_2-e	CO_2 equivalents for all greenhouse gases
DB AG	German Railways AG
ETS	Emissions Trading Scheme
EKF	Energy and Climate Fund
EMAS	Eco-Management and Audit Scheme (Community eco-management and audit scheme)
EMU	Electric multiple unit
EV	Electric vehicle
FFH	Flora-Fauna-Habitat
FTIP	Federal Transport Infrastructure Plan
FC	Financial cooperation
GAK	Joint Task “Improvement of the Agricultural Structure and Coastal Protection”
GHG	Greenhouse gas
ICMA	International Capital Market Association
ICT	Information and communication technology
IZB	Infrastructure Status Report
LuFV	Service and Financing Agreement
LULUCF	Land Use, Land Use Change, Forestry
N/A	not available
NAPE	National Action Plan on Energy Efficiency
NBS	Newly built line
NDC	Nationally determined contributions to Paris climate targets
NIP	National Innovation Programme
NO_x	Nitrogen oxides
NRVP	National Cycling Plan
ODS	Ozone depleting substances
ÖPNV	Local public transport
PACTA	Paris Agreement Capital Transition Assessment
PM10	Fine dust
PV	Photovoltaics
R&D	Research and development
SGV	Rail freight transport
SME	Small and medium-sized enterprises
SPNV	Local passenger rail transport
TEN	Trans-European Networks
tkm	Tonne-kilometres
TC	Technical cooperation
VB	Prior need
VDE	German Unity Transport Project

Published by

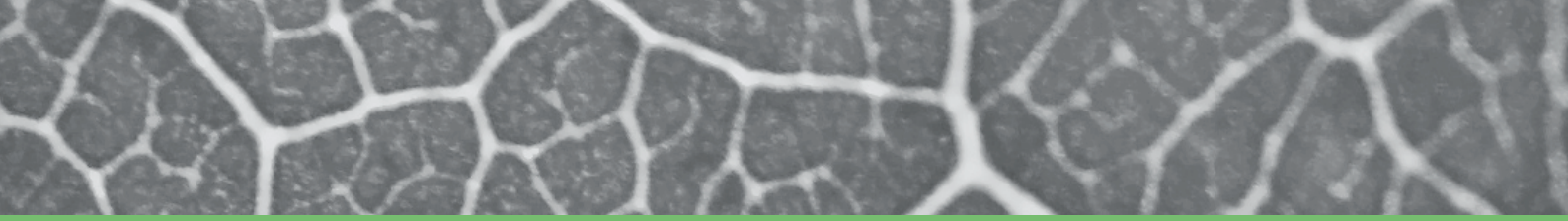
Federal Ministry of Finance
Public Relations Division
Wilhelmstr. 97
10117 Berlin, Germany

September 2022

Edited by
Division VII C 2

More information is available online at
www.bundesfinanzministerium.de

This brochure is published as part of the
German federal government's public relations.
It is distributed free of charge and is not intended for sale.



bmf.bund.de