Bundesrepublik Deutschland
Finanzagentur GmbH

Federal Republic of Germany
Green Bond
Investor Presentation

May 2021

Agenda

Executive Summary

Climate Protection Policy

- Environmental and climate protection are a top priority in Germany. The federal government is pursuing the goal of being climate neutral by 2050 and is setting ambitious climate targets across a wide range of sectors, nationally and internationally.
- Since 1990, Greenhouse gas (GHG) emissions have been reduced by more than 40% (2020). The 2030 objective is to reduce GHG emissions by 55%, the 2050 objective is GHG emission neutrality.

Green Budget Expenditure

- Green Federal securities are part of Germany's sustainability strategy. They strengthen green financial markets and increase the transparency for selected green budget items.
- Indicative amount of eligible green expenditures for 2020 budget: € 14.0 bn (2019: € 12.3 bn), selected from five sectors: (1) transport; (2) international cooperation; (3) research, innovation and awareness raising; (4) energy and industry; (5) agriculture, forestry, natural landscapes and biodiversity.

Green Federal Securities

- Planned issues in 2021: the first 30-year Green Bund, and a new 10-year Green Bund. The aggregate annual issuance volume will be allocated to the green eligible expenditure of the 2020 budget.
- Germany will continue to establish a green yield curve.
- The unique and innovative twin bond concept makes the 'greenium' transparent and has created a new benchmark in the green bond market.

Transaction Overview

Details on the 30y Green German Federal security	
Date	[ ] May 2021
Maturity date	15 August 2050
Reference "twin" bond	30y Federal bond issued on 21 August 2019 (ISIN DE0001102481)
Volume	Benchmark size (at least EUR 4 bn)
Settlement date	T+5
Coupon	0%
Initial spread guidance	To be announced on [ ] May 2021
Country ratings	Aaa/AAA/AAA
Joint Lead Managers	To be defined
ISIN	DE0001030724

1 Germany's Green Footprint

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Following a Stringent Green Path – Germany`s Contribution to the 1.5 Degree Celsius Target

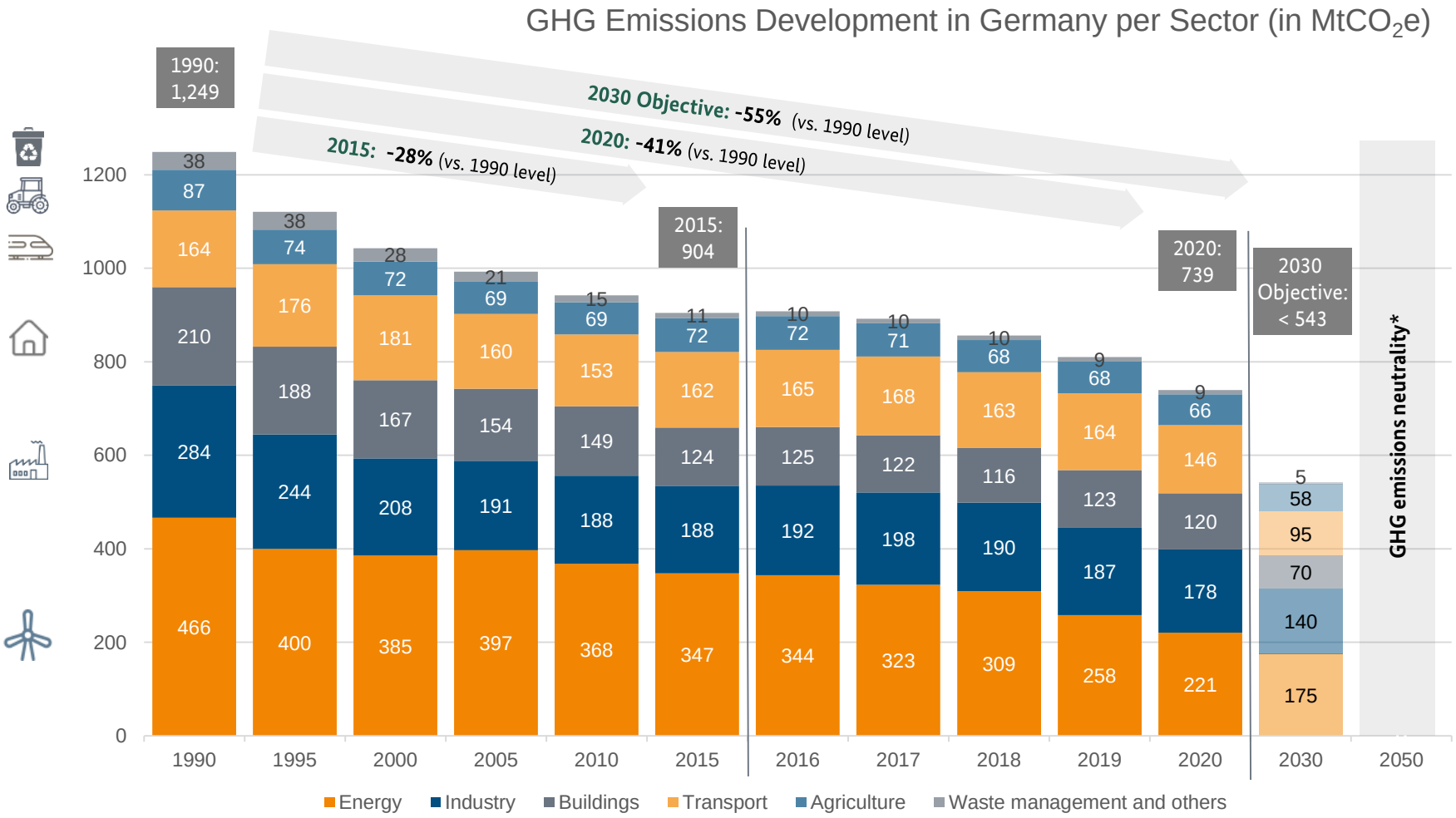
With the United Nations' 2030 Agenda for Sustainable Development and the Paris Climate Agreement, the German Government is pursuing the clear goal of setting the course for a sustainable social and economic system. Climate protection is a core priority, thus, Germany was one of the first countries to submit the long-term low GHG emission development strategy to the UN as required under the Paris Agreement.

In its Climate Action Plan 2050, Germany confirms its ambitious climate targets and also lays down concrete 2030 mid-term targets for the individual sectors, including evaluation, monitoring and updating procedures.

With the Climate Action Programme 2030, a new level of commitment is set in German climate policy, even regulated by law: For the first time, the national climate targets are given legal status with the Climate Protection Act.

Furthermore, the Climate Action Programme paved the way for the Inaugural Green Federal securities. With the innovative twin bond approach, Germany makes a substantial contribution to the growth of the sustainable bond market.

The Big Picture: Path to Decarbonisation



*Source: Umweltbundesamt, 19.04.2021, https://www.umweltbundesamt.de/en; *net zero anthropogenic GHG emissions from all sectors covering all GHG emissions, which means emissions from carbon dioxide as well as other GHG like methane*

Focus on Energy Area

Energy

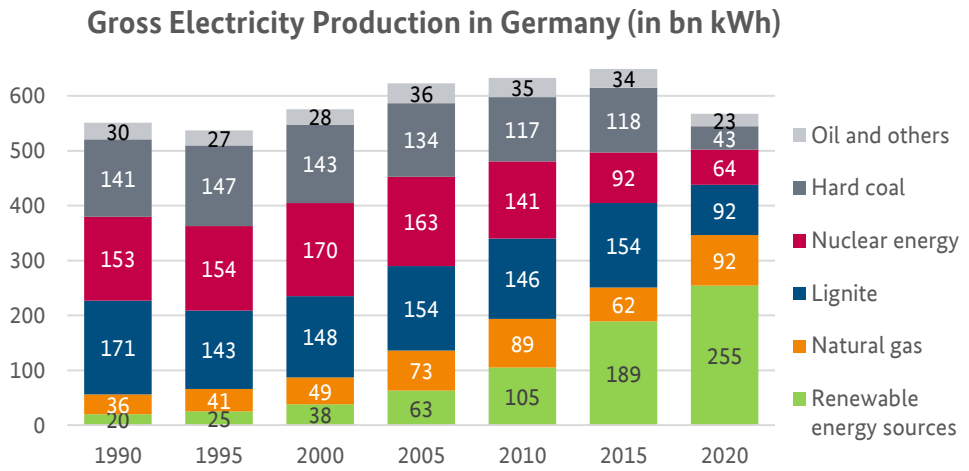
Share of CO_2 emissions	30% of all CO_2 emissions in Germany
2020 achievement	221 $MtCO_2e$ (– 53% vs 1990 level)
2030 target	175 $MtCO_2e$ (– 62% vs 1990 level)

Overview

- Through ambitious targets and regulatory measures, such as the Renewable Energy Sources Act (EEG), GHG emissions in the energy sector have been halved since 1990.
- Full decarbonisation by 2050 through the gradual transformation of the energy supply towards more renewable energies and energy efficiency.

Germany's path to the energy system of the future

- No more power from coal by 2038 *"Kohleausstieg"*
- No more nuclear power by 2022 *"Atomausstieg"*
- Renewables to generate 65% of Germany's power by 2030 *"Energiewende"*



Source: Destatis; kWh: kilowatt hour

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Focus on Industry Area

Industry

Share of CO_2 emissions	24% of all CO_2 emissions in Germany
2020 achievement	178 $MtCO_2e$ (– 37% vs 1990 level)
2030 target	140 $MtCO_2e$ (– 51% vs 1990 level)

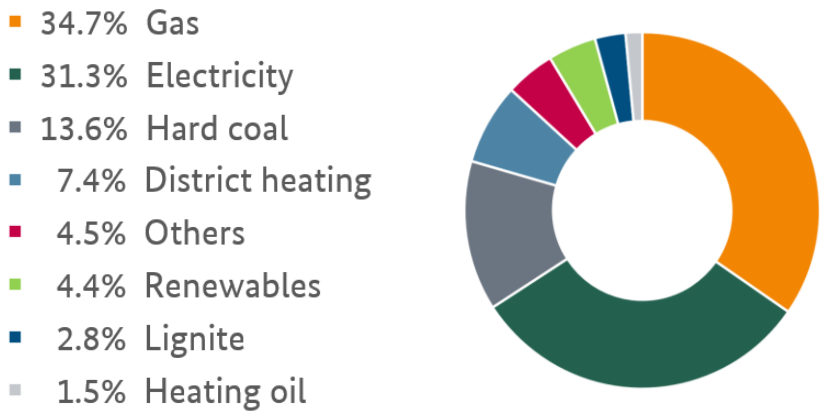
Overview

- The decarbonisation of the industrial sector is to be achieved through a comprehensive modernization strategy.
- Industry will become more climate-friendly with increased efficiency, more renewable energies and new production processes (e.g. “green” hydrogen).

Transforming the industry sector

- National decarbonisation programme
- Support for the value chain of electric mobility
- Promoting energy and resource efficiency

Final energy consumption by energy source in industry (2018)



Source: BMU, Climate Action in Figures 2020

Focus on Buildings Area

Buildings

Share of CO_2 emissions	16% of all CO_2 emissions in Germany
2020 achievement	120 $MtCO_2e$ (– 43% vs 1990 level)
2030 target	70 $MtCO_2e$ (– 67% vs 1990 level)

Overview

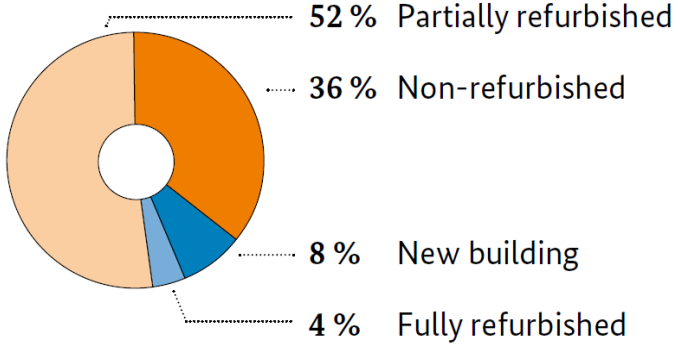
- The basis for making building and living more climate-friendly is a mix of increased promotion, information and advice, CO_2 pricing and regulatory law, e.g.:
  - Home owners receive a payment for replacing old oil central heating.
  - KfW is extending higher loans for the purchase, restoration or construction of energy-efficient buildings.

Source: BMU, Climate Action in Figures 2020

Sustainable green housing

- Upgrading heating systems
- Tax incentives for energy upgrades
- Developing energy standards
- Supporting modular upgrades

Share of residential buildings by refurbishment status (2019)



Focus on Transport Area (1/2)

Transport

Share of CO_2 emissions	20% of all CO_2 emissions in Germany
2020 achievement	146 $MtCO_2e$ (– 11% vs 1990 level)
2030 target	95 $MtCO_2e$ (– 42% vs 1990 level)

Overview

- With record-high investments into clean and sustainable transportation such as rail, public and non-motorised transport, as well as electro-mobility and alternative fuels (especially hydrogen), transport-related emissions should be cut significantly by 2030.
- Investments in the railway system are both a key area of action in the Climate Action Programme 2030 and a key part of Green Bunds.

New pathways for transportation

- Fundamental and massive overhaul of transport sector
- Increasing the share of passenger and freight rail transport in the modal split
- Increasing the share of the mileage in heavy road haulage of vehilces powered by electricity or electricity-based fuels.
- Expanding the charging infrastructure for electric mobility
- Expanding cycle routes
- Digitalisation of mobility

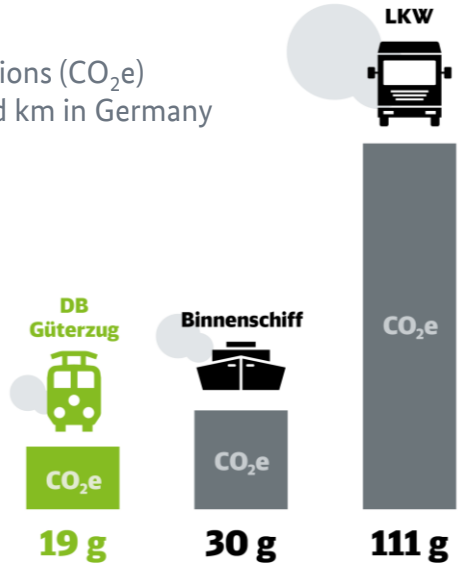
Focus on Transport Area (2/2)

Transport

Investment in the railways

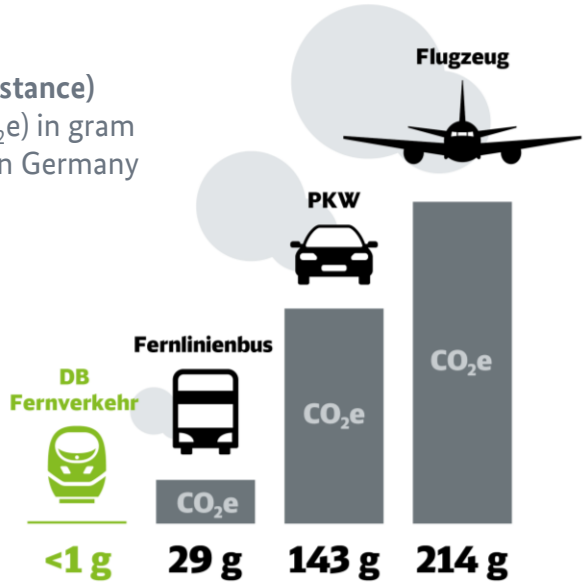
Strengthening rail freight transport

Freight GHG emissions (CO_2e) in gram per ton and km in Germany



Making rail travel more attractive by modernising the rail network

Passengers (long-distance) GHG emissions (CO_2e) in gram per person and km in Germany



Source: Deutsche Bahn AG, Janurary 2021

Focus on Agriculture

Agriculture

Share of CO_2 emissions	9% of all CO_2 emissions in Germany
2020 achievement	66 $MtCO_2e$ (– 24% vs 1990 level)
2030 target	58 $MtCO_2e$ (– 33% vs 1990 level)

Sustainable agriculture - a mix of measures to make the sector more climate-friendly

- Sustainable farming
- Conservation and sustainable management of forests and timber use
- Avoiding food waste

Focus on Waste Management and others

Waste manage-ment and others

Share of CO_2 emissions	1% of all CO_2 emissions in Germany
2020 achievement	9 $MtCO_2e$ (– 77% vs 1990 level)
2030 target	5 $MtCO_2e$ (– 87% vs 1990 level)

Waste management is at a very high level in Germany already. Waste is collected, separated, reused, recycled or used for energy.

2 Green Bond Framework Overview

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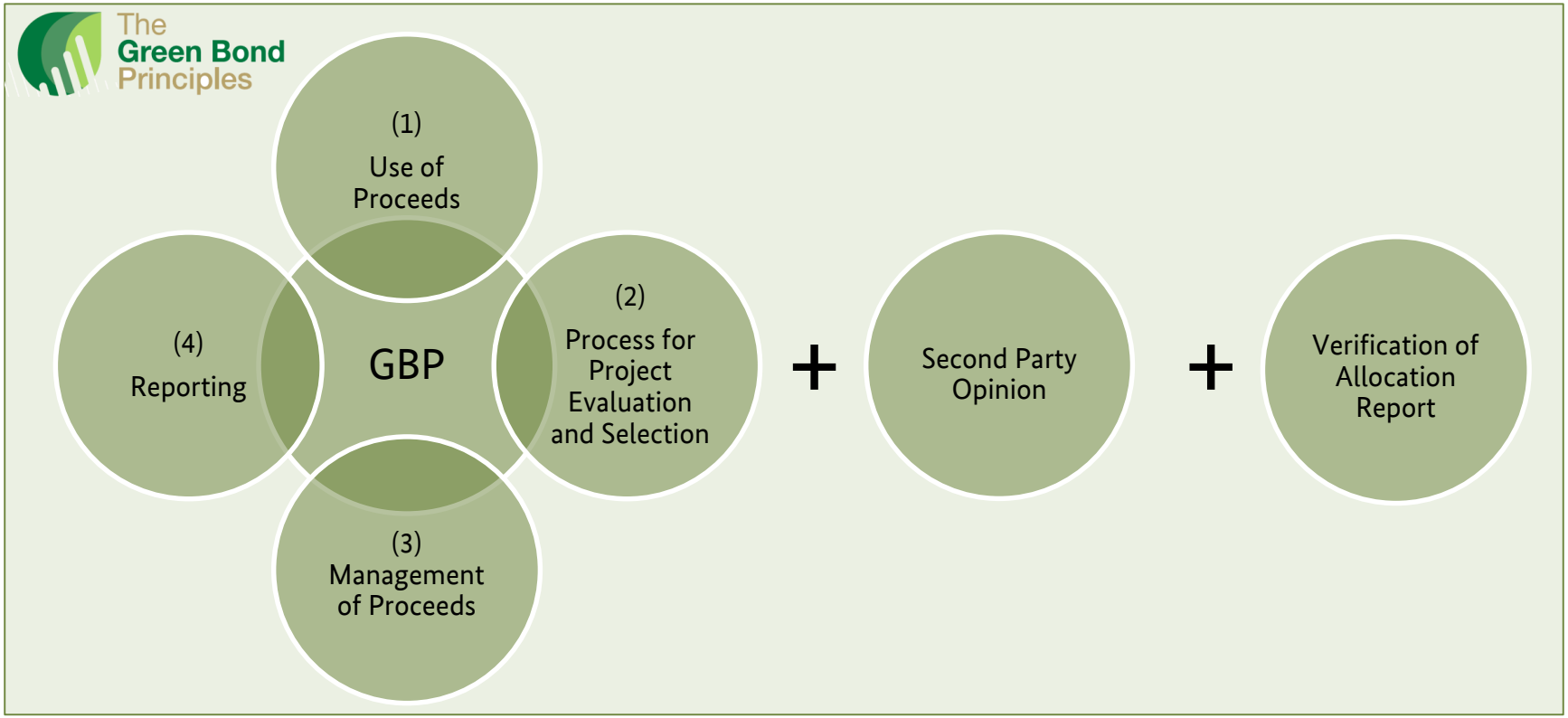
Overview of the Green Bond Framework

- Germany‘s Green Bond Framework follows the ICMA’s Green Bond Principles (“GBP”)
- The Framework is also in line with the key elements of the draft EU Green Bond Standard
- Notably, the six EU environmental objectives and at least 12 out of the 17 UN Sustainable Development Goals are mapped
- A Second Party Opinion as well as a Third Party Verification of the Allocation Report are provided

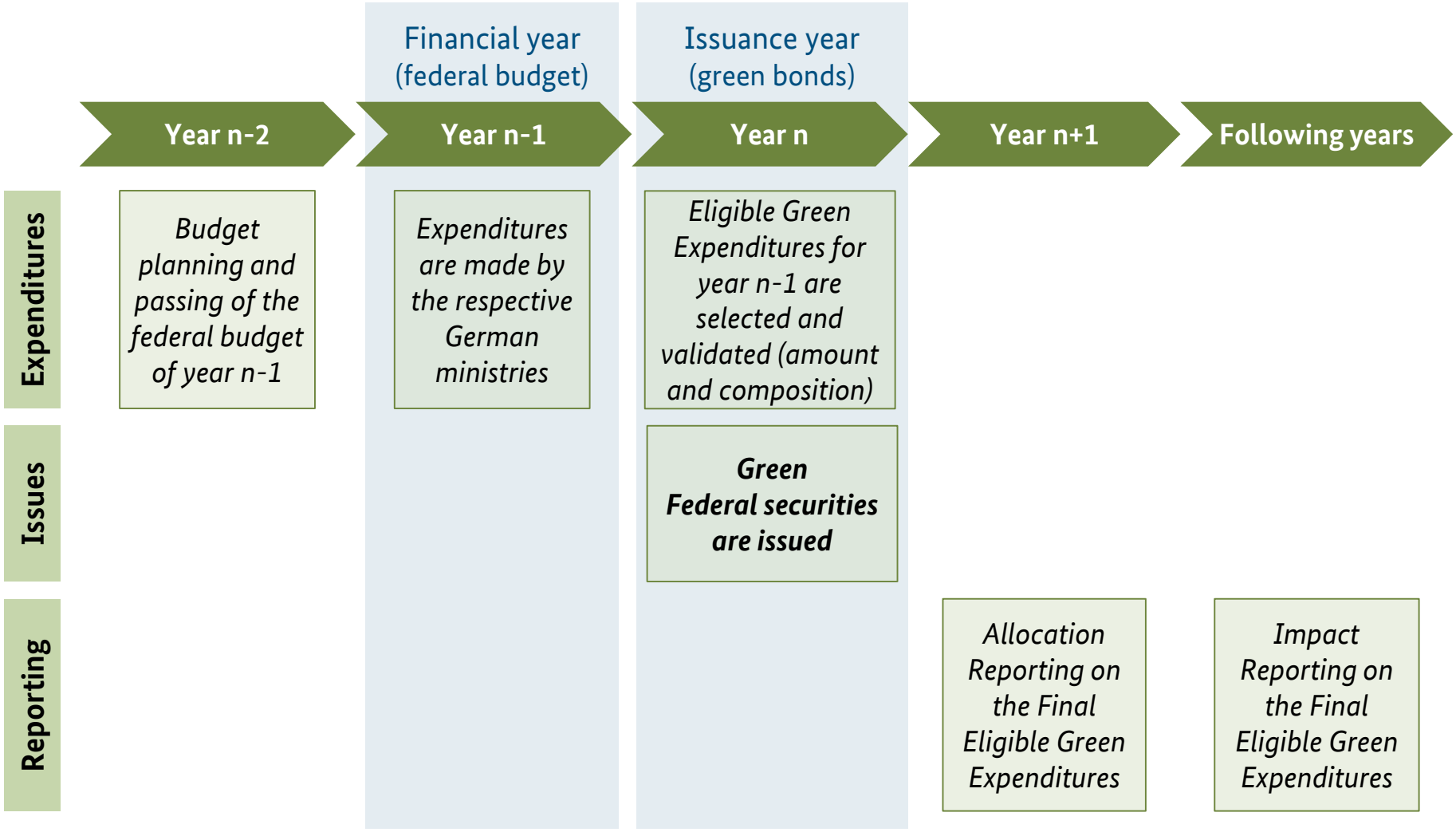


Use of Proceeds: Five Green Sectors, and Mapping According to the Six EU Environmental Objectives

- Germany's Green Bond Framework provides for five sectors for the use of proceeds.
- Eligible Green Expenditures within the identified Green Sectors contribute to the six Environmental Objectives of the EU Sustainable Finance Taxonomy Regulation as laid down in the high-level mapping below.
- Germany intends to become aligned with the EU Green Bond standard and the EU Taxonomy, as far as it can be applied by sovereign issuers. Further developments of the EU Green Bond Standard, the EU Taxonomy as well as the development of the green bond market will be followed closely.

Green Sectors / Environmental Objectives	Transport	International cooperation	Research, innovation and awareness raising	Energy and industry	Agriculture, forestry, natural landscapes and biodiversity
Climate change mitigation	✓	✓	✓	✓	✓
Climate change adaptation	✓	✓	✓		✓
Sustainable use and protection of water and marine resources		✓	✓		✓
Transition to a circular economy		✓	✓		
Pollution prevention and control	✓	✓	✓		
Protection and restoration of biodiversity and ecosystems		✓	✓		✓

Project Evaluation, Selection and Reporting



Examples of Impact Reporting Approaches

Sector	Indicative impact report indicators
Transport	• Greenhouse gas emissions avoided (when possible) • Length of electrified railway-km • Length of newly built railway-km • Length of newly built bicycle lanes • Final reports about and descriptions of projects
International cooperation	• Greenhouse gas emissions avoided (when possible) • Specific reports about the environmental efficiency of the German international cooperation and the mobilisation of private capital • Listing of main initiatives and projects and presentation of key examples, and / or a description of mandates of financed multilateral institutions as well as international organisations and funds
Research, innovation and awareness raising	• Standard research indicators • Total funding or number of funded projects • Lists of main initiatives or presentation of key examples
Energy and industry	• Greenhouse gas emissions avoided (when possible) • Reduction of energy consumption, share of renewable energies • Specific reports about the climate and environmental efficiency of the subsidies
Agriculture, forestry, natural landscapes and biodiversity	• Specific reports about the climate and environmental efficiency of the GAK-policy (Gemeinschaftsaufgabe Agrarstruktur & Küstenschutz: joint task of agricultural structure and coastal protection)

3 Green Federal Securities in Practice - Eligible Green Expenditures

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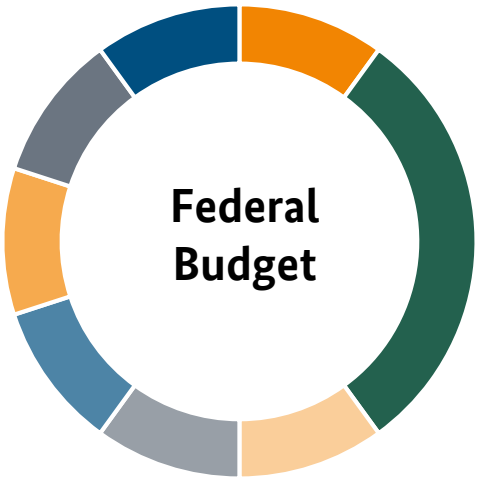
The Bigger Picture:
Climate protection policy is much more comprehensive

- German climate and environmental protection policies are very extensive.
- The federal budget contains a significant amount of green expenditures.
- The reporting for Green German Federal securities provides high transparency regarding the allocated green expenditures.

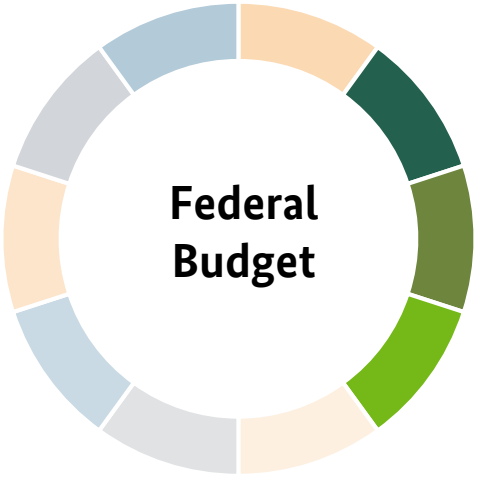


The federal budget contains many more green items than those selected for Green German Federal securities:

- Eligible green expenditures earmarked for the NGEU funding program
- Green expenditures associated with funds raised by the Carbon Pricing Scheme, channeled through the Energy and Climate Fund (EKF)
- Grants to increase energy efficiency in buildings associated with KfW Green Bonds
- Further green expenditures, which are neither earmarked for a green bond program nor part of the EKF

High Level of Transparency and Strict Standards

- **Exclusion of double counting:**
  Expenditures allocated to Green German Federal securities are earmarked for this purpose only, and will not overlap with the use of any other green funding source.



Clear differentiation of green expenditures:

- Measures and budget items proposed by the federal government in the German Recovery and Resilience Plan (DARP) for the NGEU program (e.g. national hydrogen strategy, further development of electric mobility and charging infrastructure for electric mobility) are excluded from the allocation to Green Bunds.
- Only EKF expenditures in the amount financed by the federal budget (including reserves) are taken into account for Green Bunds.
- Federal budget items associated with KfW Green Bonds (grants to increase energy efficiency in buildings) are excluded from the allocation to Green Bunds.

Overview Use of Proceeds: Eligible Green Expenditures (€ mn)

Green Sectors	2020 Indicative	2019 Final	Sector Details	Case Studies
Transport	8,000	7,125.3	Sub-categories: Rail transport / Alternative drive systems and fuels / Public transport / Waterways / Cycling infrastructure	1-3
International cooperation	3,200	2,981.7	Objective: Assist EM and developing economies in their transition towards greater environmental sustainability; Governance: p. 23	4-7
Research, innovation and awareness raising	1,100	625.1	Objective: Support and facilitate knowledge and innovation about climate and environmental matters; eligible items: p. 24	8-11
Energy and industry	1,100	1,198.5	Sub-categories: Energy research / Renewable energy / Energy efficiency / National Climate Initiative	12
Agriculture, forestry, natural landscapes and biodiversity	600	381.5	Sub-categories: Sustainable agriculture and forestry / Coastal defences and food protection / Protection of ecosystems	13-15
Total	**14,000**	**12,312.1**		

Key Sector “International Cooperation”

International cooperation

Expenditure

Eligible programs and projects are targeted at mitigating and adapting to climate change, transitioning towards sustainable energy systems based primarily on renewable energy sources, improving energy efficiency, protecting habitats and biodiversity sustainable use of natural resources and energy, including developing renewable energy generation facilities and sustainable agriculture.

Governance

The selection and approval of specific projects is subject to **compliance with German law**, the Guidelines for bilateral Financial and Technical Cooperation **and all relevant international agreements and treaties signed by Germany**.

Governance safeguards and processes are in place for every type of expenditure to prevent corruption and money laundering in line with European and national legislation and standards.

Social safeguards and processes are in place for every type of expenditure to reduce the risk of forced labor and child labor and to promote and strengthen human rights in developing countries in accordance with European and national legislation and standards.

International support is reported in accordance **with internationally agreed guidelines**, criteria and reporting cycles, either as official development assistance (ODA) to the OECD Development Assistance Committee (DAC) and/or as climate finance to the EU and United Nations Framework Convention on Climate Change (UNFCCC).

Key Sector “Research, Innovation and Awareness Raising”

Research, innovation and awareness raising

Expenditure

Eligible budget items primarily include :

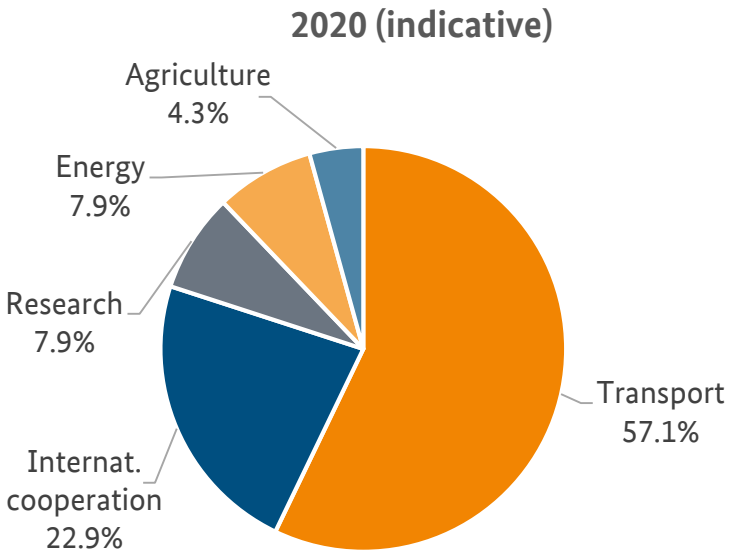
- Expenditure enabling the development of solutions for combating climate change, for the preservation of ecosystems and biodiversity and for compensating for fluctuations in power grids due to the increasing use of renewable energy sources to generate electricity
- Expenditure enabling research for all renewable energies and energy storage, energy efficiency, power grid and renewable energy integration, energy transition
- Expenditures enabling research related to climate change, biodiversity, nature protection and the environment
- Expenditures enabling research on coasts, oceans and polar areas

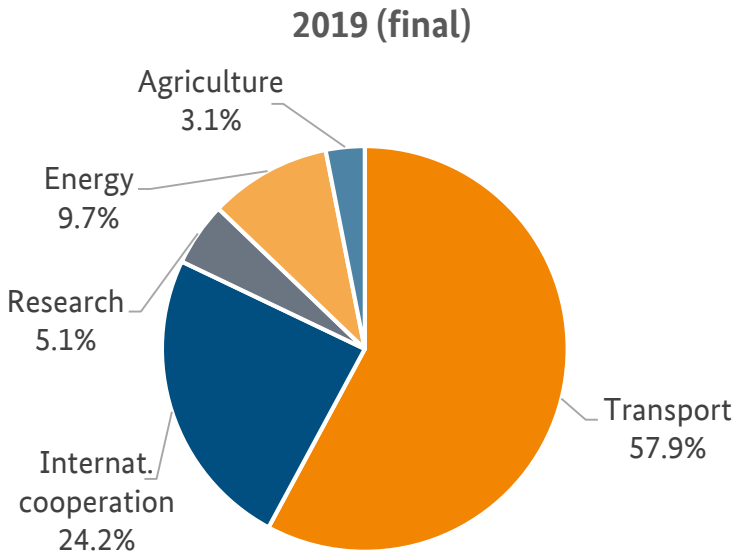
Cross-Section

In a society making a transition towards a sustainable economy, strong government commitment is essential. Thus, the federal budget contains considerable green expenditures on research, innovation and awareness raising. Including green expenditure on research and innovation in the other four Green Sectors, overall spending in this area is much larger than € 0.6 bn in 2019 and € 1.1 bn in 2020.

Stable Contributions of Eligible Green Expenditures: Breakdown by Green Sector

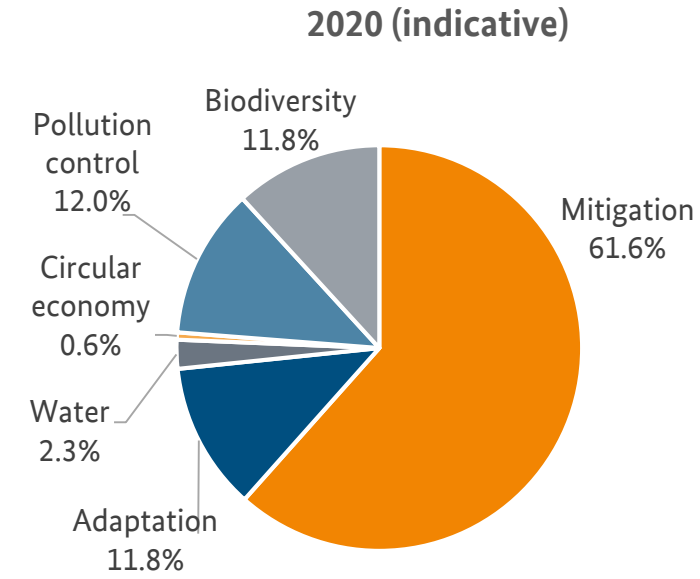
(1) Transport	(2) International cooperation	(3) Research, innovation and awareness raising	(4) Energy and industry	(5) Agriculture, forestry, natural landscapes and biodiversity

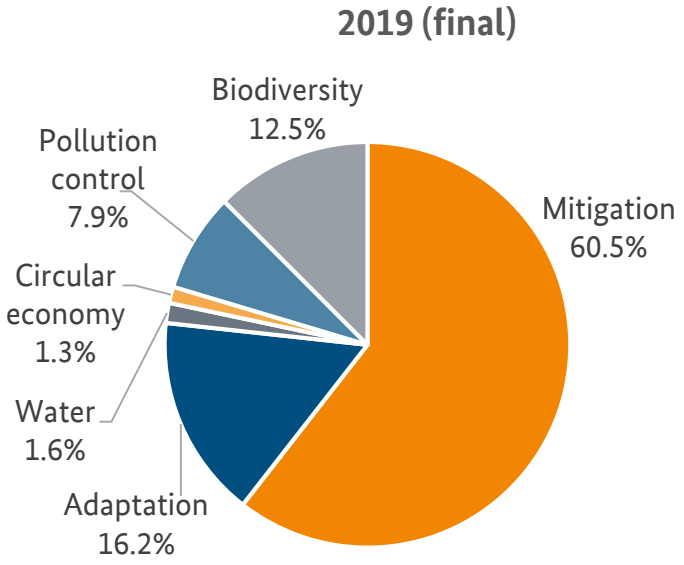




Stable Contributions of Eligible Green Expenditures: Breakdown by EU Environmental Objective

Climate change mitigation	Climate change adaptation	Sustainable use and protection of water and marine resources	Transition to a circular economy	Pollution prevention and control	Protection and restoration of biodiversity and ecosystems





Symbols are taken from „Financing Sustainable Growth“, European Union, 2019.

4 Green Federal Securities Execution - Strategy and the Twin Bond Concept

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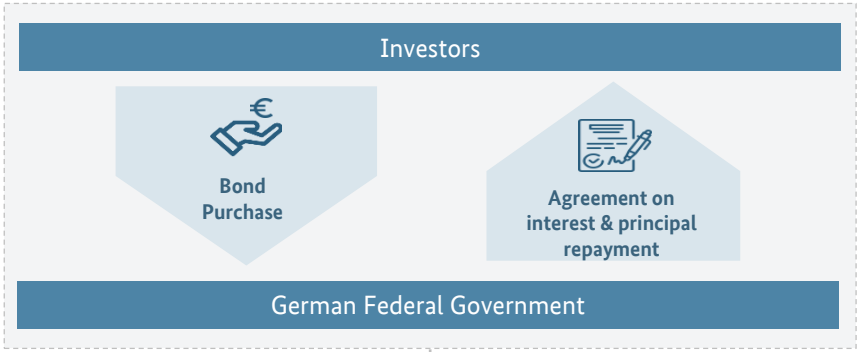
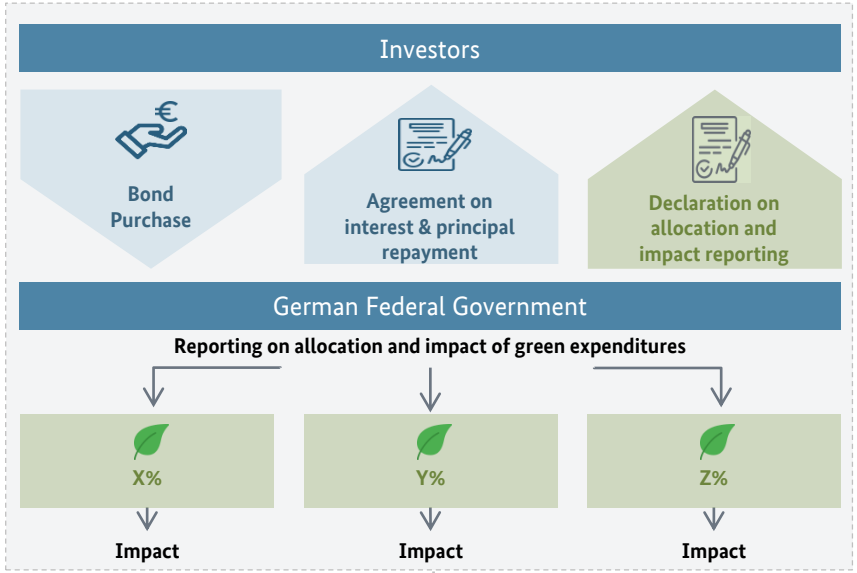
Twin Bond Concept

Conventional German Federal security "Conventional twin"



Green German Federal security "Green twin"



Main terms (new 30y twins)

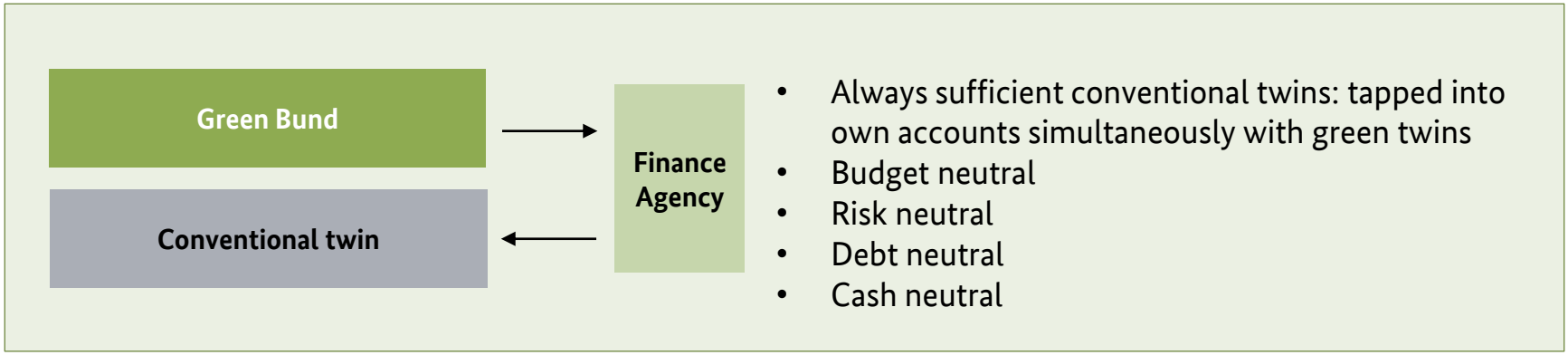
		Conventional twin	Green twin
Identical to both twins	Maturity segment	30y	
	Coupon	0.00%	
	Interest dates	Annually	
	Maturity	15 August 2050	
	Future-Contracts	Deliverable	
Different for each twin	Issuance volume	EUR 20.5 bn	Benchmark size (at least EUR 4 bn)
	Pricing date	21 August 2019	[ ] May 2021
	ISIN	DE0001102481	DE0001030724

Secondary Market Activity by Finanzagentur Ensures Liquidity

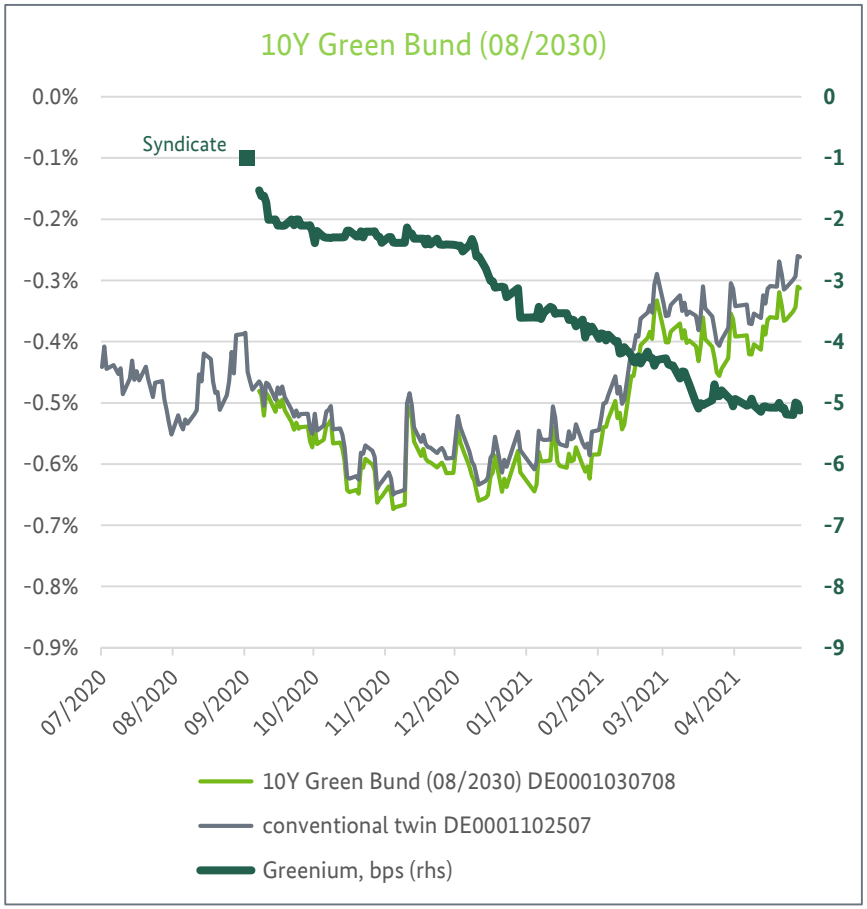
1. Outright ("one-way") sales and purchases

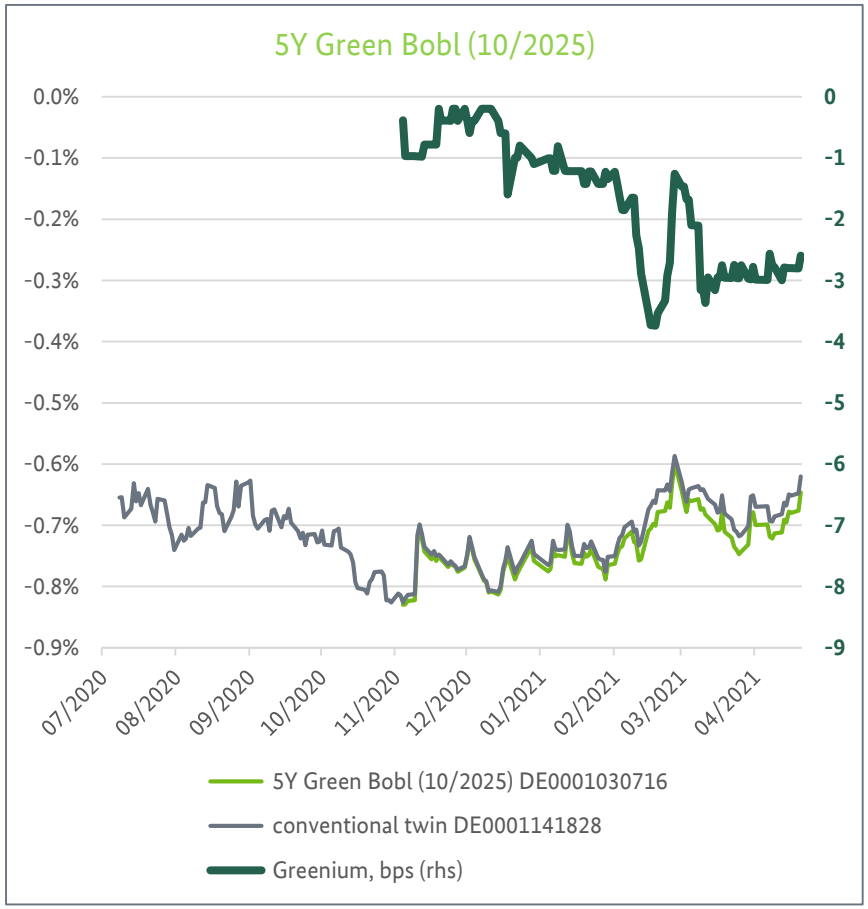
2. Repurchase agreements and securities lending, using the Federal Government's own stock of Green Bunds

3. Combined and debt-neutral sale-and-purchase (switch) transactions: Most powerful tool



Secondary Market Performance of German Twins: Making the ‚Greenium' Transparent



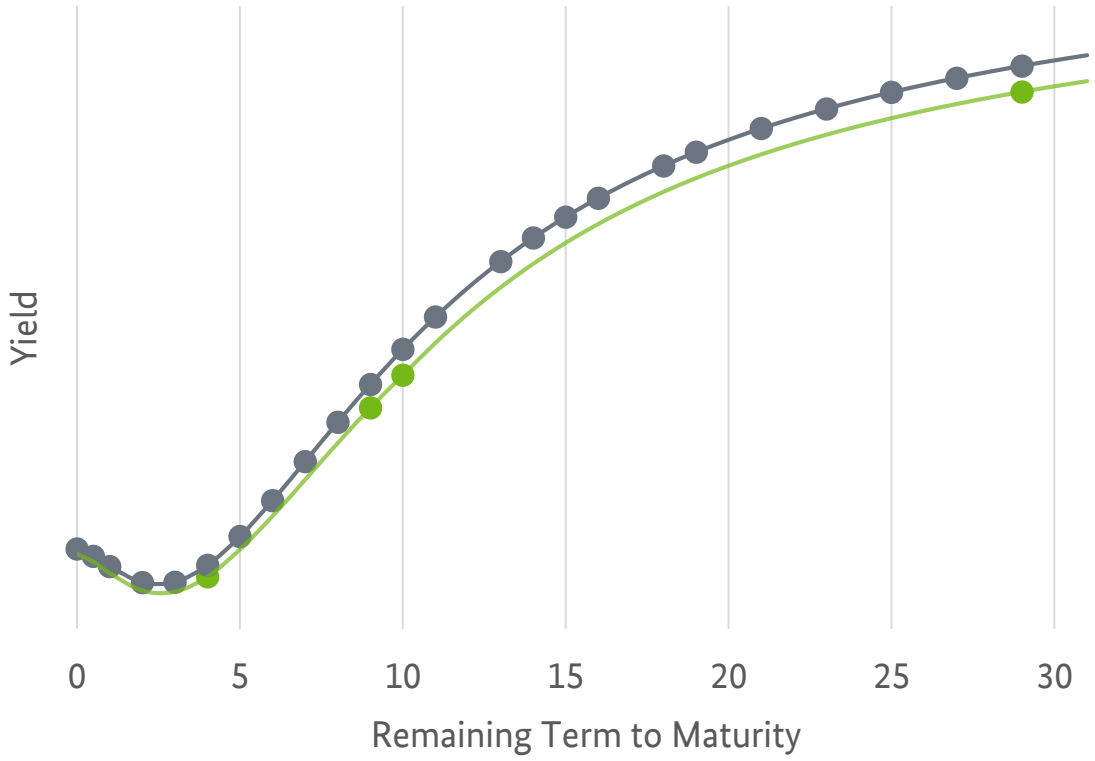


Source: Deutsche Bundesbank, daily reference yields; Greenium = yield spread between green and conventional bond

The Twin Bond Concept Creates a Liquid Curve and Offers a Diversified Maturity Spectrum for Different Investor Types

- Germany will be a permanent issuer of green bonds.
- Liquid green yield curve acts as a reference for the euro area.
- This curve serves different investor type needs, e.g.:
  - Duration considerations
  - Liquidity considerations

Green and conventional Bund Curve (schematic)



Developing Sustainable Finance Markets by Applying the Twin Bond Concept

The twin bond concept ...

1	... transfers the Bund´s established market approach to the green segment
2	... creates a liquid curve and offers a diversified maturity spectrum for different investor types
3	... provides full price transparency and allows for outperformance of the green twins

- **will therefore accelerate the development of sustainable finance markets**
- **will serve as a catalyst to channel more investments towards a more environmentally friendly economy**
- **will attract new investors to the Green Bond market**

5 Selected Case Studies of Eligible Green Expenditures

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Case Study 1: Upgraded line Ulm –Lindau

(1) Transport

Objective

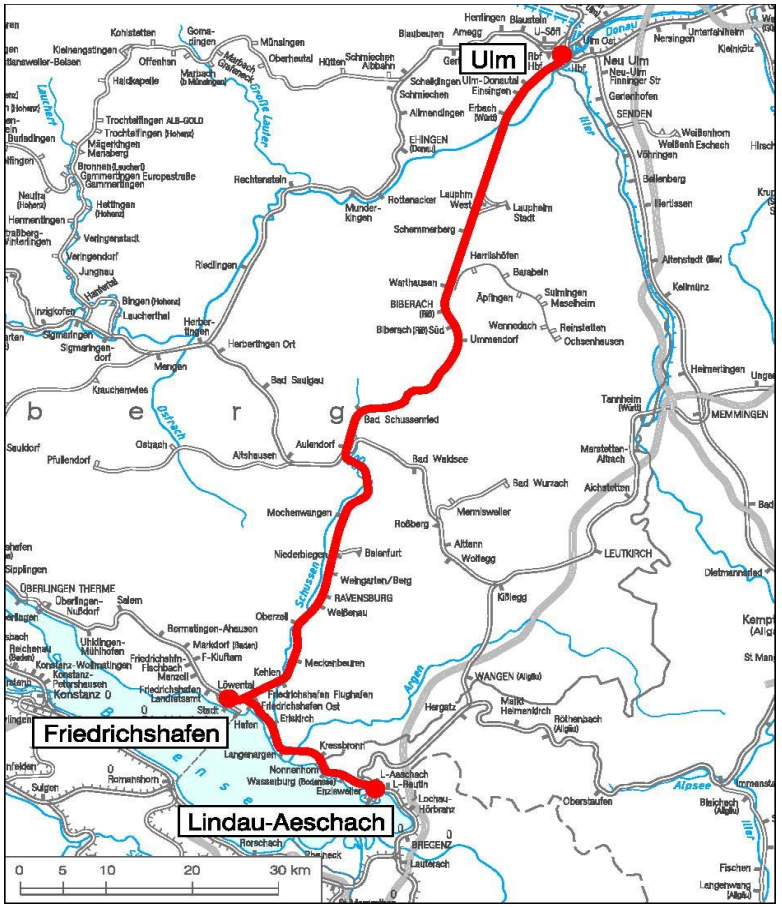
- Increasing rail track speed and capacity for passenger transport

Output and measures

- Ulm–Friedrichshafen railway, also known as Südbahn used to be a non-electrified main line in the state of Baden-Württemberg (built from 1846).
- The route will be upgraded and electrified.
- Additionally, there is an extension to Lindau as part of the "Bodenseegürtelbahn".
- The total length of the route is 127 km.
- The total costs amount to approx. EUR 225 mn.

Achievements

- Extension to Lindau as part of the "Bodensee-gürtelbahn"
- The rail tracks are prepared for train speeds up to 160 km / h
- The project is being carried out since 2015 (preparation), construction has started in March 2018 and it is expected that the process can be completed by December 2021



Source: Deutsche Bahn AG, 2020, Neubaustrecke Ulm-Lindau

Case Study 2: MariData - Comprehensive Technologies for Ship Energy Management

(1) Transport

Objective	• Reduction of GHG emissions from ships • Compliance with regulations of the International Maritime Organisation (IMO) • Development, improvement and classification of modules for ship energy management using a combination of state-of-the-art maritime technologies and experience as well as AI-based instruments and methods for a holistic ship energy management • The focus is on the fuel consumption for the entire shipping
Output and measures	• A reduced energy demand on ships of at least 10% is expected • A potential of CO_2 reduction of about 95 million tonnes per year for the entire shipping • The project is being carried out between Dec. 2020 and Nov. 2023 • Federal funding is EUR 7.2 mn
Selected project partners	• Hamburg Ship Model Basin, Development Centre for Ship Technology and Transport Systems (DST), Friendship Systems, Technical University of Berlin, Hamburg University of Technology, University of Lübeck, Flensburg University of Applied Science, 52°North, Carl Büttner Shipmanagement, AVL Germany, AVL Software & Functions

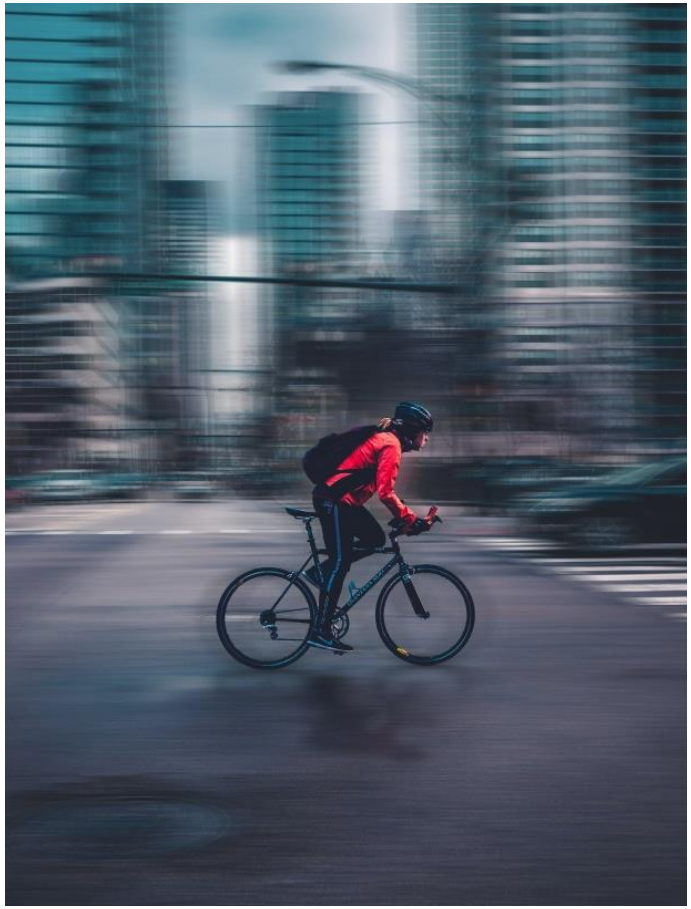
MARIDATA

Source: MariData

Case Study 3: Bicycle Lanes (National Cycling Plan)

(1) Transport

Objective	• Ensuring more, better and safer bicycle traffic by 2030
Output and measures	• Both the number and the length of the routes covered by bicycles should grow by 50% to 180 routes per person and year by 2030 with an average distance of 6 km per route • In order to achieve this goal, the Federal government is funding fast cycling routes ("**Radschnellwege**"), initially with EUR 25mn annually
Achievements	• In 2020, 113 km of cycle paths were completed, resulting in cycle paths on approx. 14,600 km of federal highways in the federal government's construction load • Radschnellwege are already built for instance between Frankfurt and Darmstadt or along the Ruhr in Gelsenkirchen • Germany's National Cycling plan 3.0 will be launched in 2021



Source: Radschnellwege bringen Fahrradfahrer zügig & sicher ans Ziel! (BMVI, 2020); photo: Max Bender

Case Study 4: Renewable Power Plant - India

(2) International cooperation

Objective	• Provision of a development loan to the "West Bengal State Electricity Distribution Company Limited" (WBSEDCL) to increase the **generation of electricity from renewable energies**, feeding into the power grid in West Bengal. Therefore, additional capacities for solar PV will be installed.
Output and measures	• Total investment: EUR 94 million • German federal subsidy: EUR 4.7 million • The project is being carried out until Dec. 2027 (expected)
Achievements	• Newly installed energy production capacity maximally achievable under optimal conditions at a given point in time: 125 MW • Newly produced energy from installed renewable sources per year: 175,000 MWh • **Reduction of 163,000 tons CO2 emissions per year**
Project partner	• The project is implemented by KFW

Source: Renewable Energy in India, KfW

Case Study 5: Energising Development (EnDev)

(2) International cooperation

Objective

- Promotion of climate-friendly access to energy for households, social infra-structure and MSMEs in Africa, Asia and Latin America

Achievements

- From the project start in 2005 until 2020, **access to climate-friendly energy** was 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)
- Carbon emissions savings directly linked to EnDev´s interventions accumulate to **16.9 million tonnes of CO_2e** (2.38 million t CO_2e in 2020) and have continuously increased
- Rigorous monitoring and verification system based on data collection on country level, quality checks, external verification, and aligned with international standards and methodologies.
- GIZ **Safeguards & Gender** system applied (incl. environmental assessments, peace and conflict analysis, gender analysis)
- Multi-Donor Partnership co-funded by Germany (financial share of 25%), the Netherlands, Norway, and Switzerland and other co-funding partners
- German federal funding in 2020: EUR 24 million

Project partner

- EnDev is implemented by giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in cooperation with other implementing organizations
- Website: www.endev.info

Source: Energising Development, GIZ

Case Study 6: Green Climate Fund (GCF)

the central multilateral instrument of international climate finance under the UN Framework Convention on Climate Change (UNFCCC)

(2) International cooperation

Objective	• The aim of the GCF is to support developing countries with particularly transformational projects for low-emission and climate-resilient development.
Output and measures	• The fund provides grants, loans, equity and guarantees for mitigation and adaptation measures.
Achievements	• 173 projects in more than 100 countries have been approved with a GCF financing of USD 8.4 billion. • Supported projects include the large-scale development of renewable energies, the implementation of climate-friendly mobility concepts, innovative protective measures against storm surges, and the development of early warning systems against severe weather. • The fund's projects are expected to save about 1.8 billion tonnes of CO_2. 498 million people are expected to benefit from increased climate resilience through GCF adaptation projects. • Germany contributed EUR 195 million to the GCF in 2020.
Project partner	• The GCF has accredited 103 national and international implementing organisations including KfW and GIZ.

GREEN CLIMATE FUND

Source: Green Climate Fund (https://www.greenclimate.fund/) and BMZ (https://www.bmz.de/en/development-policy/climate-change-and-development/climate-financing/gruener-klimafonds-60492)

Case Study 7: SAGEN

South African - German Energy Programme
Promotion of a Diverse and Inclusive Energy Transition

(2) International cooperation

Objective

- The project advises the national electricity utility and municipal distribution companies on the grid integration of renewable energies (RE) and supports selected municipalities regarding energy efficiency (EE) measures

Achievements

- In total, the project contributed to emission reductions of 228,051 tonnes of CO_2 in 2020.
- Since 2012, about 5 GW of utility-scale renewable energy has been integrated into the grid with nearly 1 GW in 2020 alone.
- In 2020, 15.6 MW of newly installed capacity of wind, solar PV and CSP plants can be attributed to SAGEN.
- The project also helped reduce electricity consumption in municipalities by a total of 20 GWh per year through EE measures such as municipal EE management systems, EE measures in the water sector, LED street lighting, etc.
- 71 municipalities are or have been supported in introducing processes and structures to support the use of RE systems in behind-the-meter-applications. “Small-Scale Embedded Generation” has produced an estimated 1,261 GWh in 2020.
- In 2020, funds of EUR 2.62 million were implemented.

Project partner

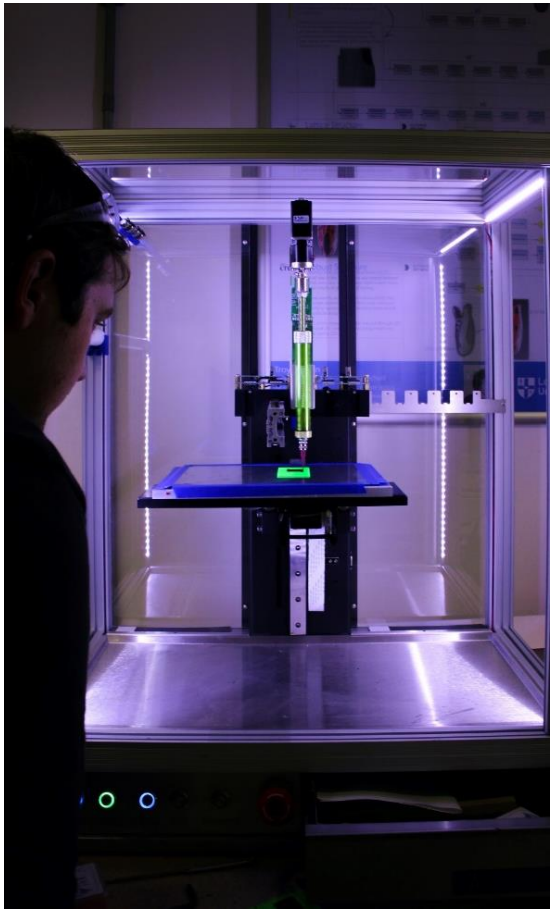
- SAGEN is implemented by GIZ
- Website: www.sagen.org.za

Source: www.sagen.org.za; CSIR Energy Centre; photos: GIZ, Glenn McCreath

Case Study 8: DigitaldruckMobil

(3) Research, innovation and awareness raising

Objective	• Small and medium-sized enterprises (SMEs) are pioneers in technological progress. The "KMU-innovativ" funding initiative supports cutting-edge research in German SMEs • In this specific project, significant energy savings through the development of a mobile digital printing device which is supposed to replace thermal marking processes are funded • The aim is to achieve energy savings of up to 50 GWh / year in Germany and up to 125 GWh / year in Europe
Output and measures	• As a result, a functional printing system model with software and a mobile hand-held printing device with a printing height of up to 50 mm and a high-resolution print head has been developed, which will be further enhanced in order to allow for series production and market introduction after the research project has been completed • Federal subsidy 2019: EUR 0.3mn • The project was carried out between July 2017 and June 2020
Selected project partners	• SMEs like Tippl GmbH (mechanics), MREletronik Gmbh & Co. KG (electronic control system) and LNT Automotion GmbH (software development)



Source: KMU-innovativ; photo: Rob Wingate

Case Study 9: Kopernikus Project SynErgie

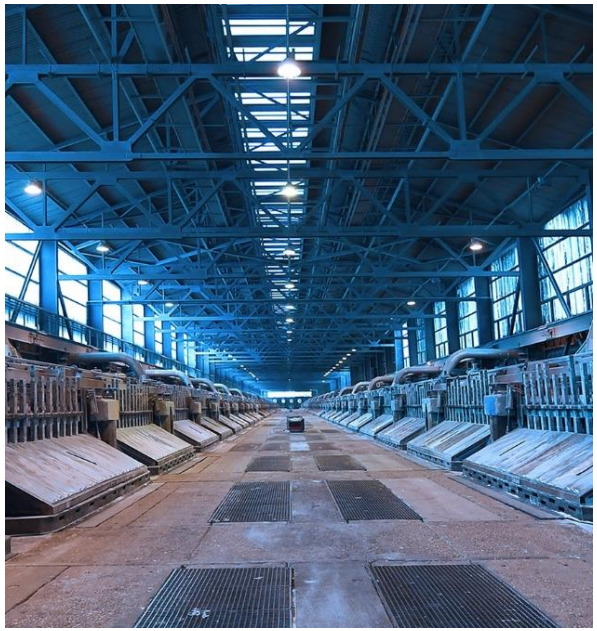
(3) Research, innovation and awareness raising

Objective

- With an increasing share of renewable energies, fluctuations in the power grid increase considerably. This project investigates how industry may help to compensate for these fluctuations by flexibly adapting its demand to the electricity supply.
- Industry has the potential to significantly offset fluctuations in the power grid. If renewables like wind and sun do not provide enough energy, industry can adjust its electricity demand and reduce electricity consumption until more electricity is available again (demand side management).

Output and measures

- SynErgie determined how much energy the German industry could either use more/ less in the event of grid fluctuations.
- Germany's largest private electricity consumer is the aluminium manufacturer TRIMET (~1% of Germany's annual electricity demand). Through the project, an approach has been developed for the company to increase or decrease its electricity consumption by 22.5 megawatts for up to two days corresponding to the output of around 25,000 three-person households.
- Federal subsidy 2019: EUR 11mn; 2020: EUR 9.3mn



Selected project partners

- University of Stuttgart, Fraunhofer Gesellschaft, Linde GmbH, UPM GmbH, TRIMET Aluminium SE, Siemens AG, Software AG, Covestro AG, Naturschutzbund Deutschland

Source: Kopernikus; photo: TRIMET's flexible aluminium furnaces (SynErgie/TRIMET)

Case Study 10: Solar Energy Use for Storage, Fuels and Industry (Projects PEGASUS, BaSiS)

(3) Research, innovation and awareness raising

Objective	• Processing sulphur as one of the most important raw materials for chemical industry by means of solar energy (PEGASUS) • On-demand solar power generation using sulphur storage technologie (BaSiS) • Long-term storage solutions to replace fossil power plants 24/7
Output and measures	• Novel power cycle combining a CSP plant with a sulphur storage system for 24 hours baseload operation • Demonstrate a thermo-chemical sulphur storage cycle to permanently and efficiently store solar energy in chemical form as elemental sulphur at a 30 times higher energy density than today's molten salt systems • Direct combustion of sulphur in gas turbines for highly efficient renewable energy recovery • Product SO2 can be used for sulphuric acid production and for hydrogen production
Project partners	• DLR, in cooperation with KIT, BrightSource (and others)

DLR Deutsches Zentrum für Luft- und Raumfahrt
German Aerospace Center

Source: DLR Solar Towers in Jülich © DLR

Case Study 11: CoBra

High Temperature Heat Pumps based on the Brayton Process located in Cottbus

(3) Research, innovation and awareness raising

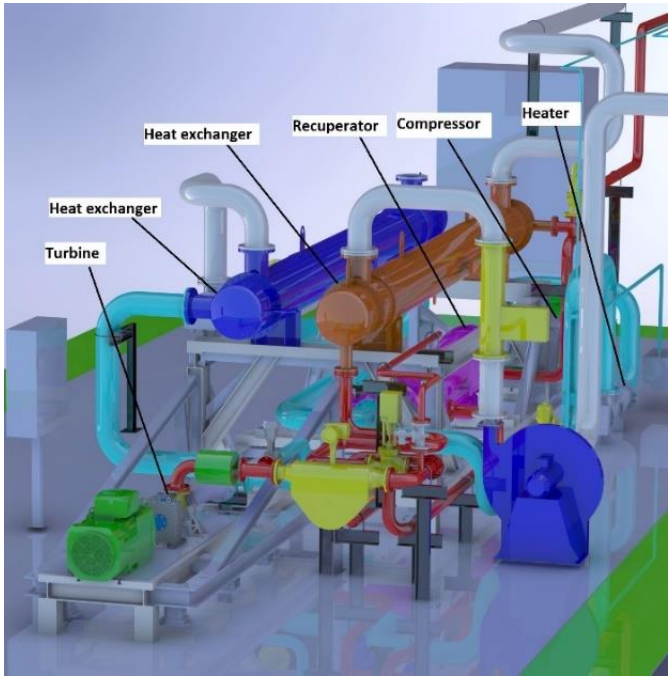
Objective

- In 2015 industrial demand for process heat was about 20% of the overall energy consumption in Germany. There is significant need in CO_2-neutral process heat in the range of 150-500°C. Market cannot provide heat pumps with adequate performance.
- Objective is the development, upscaling and integration of CO_2-neutral high temperature heat pumps in energy intensive processes of several industries (chemistry, petrochemistry, iron, steal, paper, food, cement, aluminium)

Output and measures

- Demonstrator high temperature heat pump (HTHP) in 2024 operational at DLR Cottbus
- Development of necessary turbo components
- Accompanying research will identify options for operating scenarios
- Virtual model of the HTHP and its embedding in the industrial processes
- Electrification of the industrial process heat demand up to 500 °C could result in CO_2 savings equal to the current Switzerland's CO_2 emissions

DLR Deutsches Zentrum für Luft- und Raumfahrt
German Aerospace Center



Source: DLR, CAD scheme of the first test facility for a HTHP

Case Study 12: SINTEG

Smart Energy Showcases – Digital Agenda for the Energy Transition

(4) Energy and industry

Objective

- SINTEG addressed the challenge of preparing the electricity grids for the demands of volatile power generation, which goes hand in hand with a high share of renewable energies and aims to develop model solutions for smart interplay in the production of renewable energy, the use of existing grids, energy consumption and energy storage.

Output and measures

- Safe and efficient grid operation with high shares of renewable energies
- Utilisation of efficiency and flexibility potentials (on the market and grid side)
- Efficient and secure interaction of all actors in the smart grid
- More efficient use of the existing grid structure

Achievements

- From 2016 to 2020, over 300 companies, research institutions and municipalities tested the digital energy future.
- They identified challenges and developed solutions for the next steps of the energy transition. The results of the model projects are now being compiled.

Source: https://endev.info/

Case Study 13: Project PROMAR (Prevention of Marine Litter in the Caribbean Sea)

(5) Agriculture, forestry, natural landscapes and biodiversity

Objective	• Promoting Circular Economy Solutions in the Dominican Republic, Costa Rica and Colombia to reduce marine litter
Output and measures	• Implementation of monitoring systems at a local level for monitoring the input of litter into the sea; • **Design and implementation of circular economy solutions to reduce marine litter;** • Capacity building with political partners for implementing extended producer responsibility and the circular economy solutions developed in the project; • Raising awareness about ways to avoid marine litter; • Sharing of project results with other Latin American and Caribbean countries.
Project partners	• Project lead: adelphi research gGmbH • Project partners: Parley República Dominicana SRL, CEGESTI, Centro de Producción Más Limpia y Tecnologías Ambientales (CNPML) Colombia, Associação Brasileira de Empresas de Limpeza Pública e Resíduos Especiais (ABRELPE).

Source: Grant Programme against Marine Litter, Project Overview, PROMAR; photo: Bo Eide

Case Study 14: Project InsHabNet – Insects, Habitat, Network

(5) Agriculture, forestry, natural landscapes and biodiversity

Objective

- Development of protection strategies for endangered insect populations of habitats in a fragmented landscape

Output and measures

- For this project, forests of different sizes, hedges, avenues and individual trees have been selected in a central study area (mainly Rostock district, Güstrow forest offices) in Mecklenburg-Western Pomerania
- In 2019 and 2020, the occurrence of beetles and moths in the various structural elements has been analysed
- Linear structures such as pipeline routes and their potential for biotope-connecting and insect support will be examined
- **Well-known scientists and experienced specialists** support the project team
- The project is being carried out between January 2019 and December 2021

Source: Source: BMEL Förderprojekt InsHabNet (Landesforst Mecklenburg-Vorpommern, 2019); https://www.wald-mv.de/Forstbehoerde/Forstliches-Versuchswesen/Forschungskooperation-und-Projekte/; photos: I. Brunk; U. Gehlhar; S. Poeppel

Case Study 15: Project MemoryForest

(5) Agriculture, forestry, natural landscapes and biodiversity

Waldklimafonds

SpeicherWald

Objective	• Increase the acceptance of none-active forestry and motivate the local population to actively work for forest on their doorstep
Output and measures	• While forests in Germany are sustainably managed, **forests which are dedicated to free development** also significantly contribute to climate protection and biodiversity. Currently 2.8% of them are permanently secured, however, increase up to 4.0% within the next decade is envisioned. • As part of the project, environmental education measures in schools, information and dialogue events and further training of multipliers are carried out in **five model regions**. The events are targeted at citizens, forest owners and political decision-makers.
Project partners	NABU, Klima-Bündnis

Source: https://www.speicherwald.de/

Bundesrepublik Deutschland
Finanzagentur GmbH

6 Appendix:
Contact Persons and Further Information

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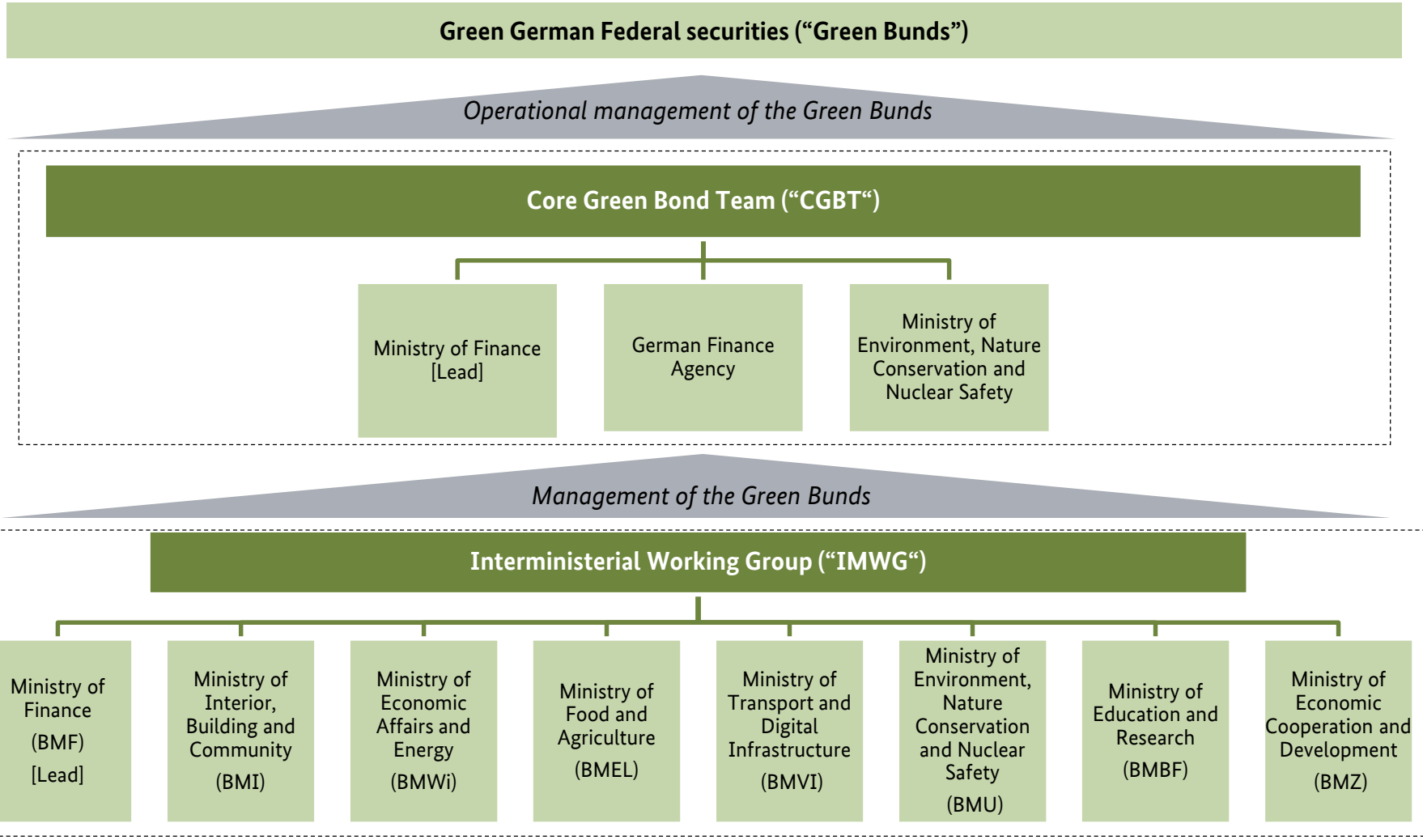
Governance of the Green Federal Securities



Issuance Calendar 2021: Nominal Federal Securities

Issuance Outlook of the Federal Government 2021 (€ bn)														
Security	Share	Annual Change € bn	Volume € bn	Q1 2021			Q2 2021			Q3 2021			Q4 2021		
				Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Schatz 2Y	**13.7%**	8	**64**	6	6	5	5	6	5	5	6	5	5	6	4
Bobl 5Y	**10.5%**	9	**49**	5	4	4	4	4	4	5	4	4	4	4	3
Bobl/g 5Y	**0%**	-5	**0**												
Bund 7Y	**4.9%**	1	**23**				4		4	3	3	3	3	3	
Bund 10Y	**10.3%**	-1	**48**	5+4	4	4	4	4	5	4	4	4		3	3
Bund/g 10Y	**1.3%**	-0.5	**6**									3	3		
Bund 15Y	**4.9%**	0.5	**23**			3+2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	
Bund 30Y	**2.5%**	-7.5	**11.5**	1.5	1.5	1.5	1.5		1.5	1	1	Syn	1	1	
Bund/g 30J								Syn							
Capital market	**48.2%**	**4.5**	**224.5**	**57**			**59.5**			**60**			**48**		
Bubill	**51.8%**	60	**241**	21	20	20	20	20	20	20	20	20	20	27	13
Money market	**51.8%**	**60**	**241**	**61**			**60**			**60**			**60**		
Year total € bn:			**465.5**	42.5	35.5	40	41	36.5	42	40.5	38	41.5	38.5	46.5	23
				118			**119.5**			**120**			**108**		

Auctions & syndicates („Syn"); new issues orange shaded, others: reopenings; without inflation-linked bonds; according to the announcements in December 2020 and March 2021

Issuance Calendar 2021: Green Federal Securities 2021

- In 2021, two new Green Federal securities will be issued
  (with their conventional twins tapped into own holdings simultaneously)
- Annual green issuance volume in comparable size as 2020
- First 30-year Green Federal bond as twin of 0% Bund (08/2050) in May
  - ➢ Longest green Euro Sovereign bond in the market
  - ➢ Extension of the curve at the long end (in the 2nd year / with 3rd issue)
- New 10-year Green Federal bond with maturity 08/2031 in autumn
- The Bund will continue to establish a green yield curve.

“A Roaring Success”: Green Federal Securities 2020

Global Capital

Green Bond of the Year

“Germany, as the de facto issuer of the safe asset of choice in euros, took the opportunity [...] to prove that green bonds do indeed trade more tightly than conventional bonds.”
“a template for sovereigns to ensure the liquidity of their sovereign curves while stepping into the green bond market”

Environmental Finance

Green bond of the year – Sovereign

“adds new concepts into traditional green bonds, such as twin-bond concept, greenium, and international cooperation as one of the use of proceeds”

CBI

Largest Green Sovereign Bond in 2020

“innovative approach [...] has created a bench-mark for the green bond entire market”
“success of Germany’s inaugural [...] sovereign has helped heighten investor demand and market interest in sovereign bonds overall”

IFR

Euro Bond of the Year *and* Sustainable Bond of the Year

“milestone in sustainable finance as its innovative twin-bond structure finally made it possible to measure the elusive green premium or “greenium” in a benchmark deal that also created a liquid green curve as a reference rate for European markets”

German Twins: Outstanding and Planned

	ISIN	issued / planned	outstanding	coupon	weblinks
Maturity 10.10.2025					
Bobl S182	DE0001141828	08.07.2020	€ 25.0 bn	0%	fact sheet
Green Bobl	DE0001030716	04.11.2020	€ 5.0 bn	0%	fact sheet press release auction allocation report
Maturity 15.08.2030					
10Y Bund	DE0001102507	17.06.2020	€ 30.5 bn	0%	fact sheet
10Y Green Bund	DE0001030708	02.09.2020	€ 6.5 bn	0%	fact sheet press release syndicate allocation report
Maturity 15.08.2031					
10Y Bund	DE0001102564	(16.06.2021)			
10Y Green Bund	DE0001030732	(08.09.2021)			
Maturity 15.08.2050					
30Y Bund	DE0001102481	21.08.2019	€ 20.5 bn	0%	fact sheet
30Y Green Bund	DE0001030724	(May 2021)		0%	

Key Internet Sources

Climate Action Programme

Die Bundesregierung

Federal Budget

Bundesministerium der Finanzen

Green Bunds / Green Bobl

Bundesrepublik Deutschland Finanzagentur GmbH

Climate Action Report

Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit

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