HZB Greenhouse Gas Balance 2021 – Abridged Report

Commissioned by Helmholz-Zentrum Berlin für Materialien und Energie GmbH (HZB)
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Helmholz-Zentrum Berlin
für Materialien und Energie GmbH

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1. General Information

Helmholtz-Zentrum Berlin für Materialien und Energie GmbH aims to achieve greenhouse gas neutrality by 2035. This objective is to be supported by a comprehensive climate protection strategy that brings together all objectives, strategies, and measures for reducing emissions and improving its greenhouse gas balance across various areas of action.
To track progress toward this target, the HZB's Board of Directors commissioned an external service provider to conduct a structured assessment of the institution's greenhouse gas emissions (CO2 footprint) based on 2021 data, following the Helmholtz Association's Sustainability Guideline. The GHG report was prepared in collaboration with Berliner Energieagentur GmbH in accordance with the Greenhouse Gas Protocol and verified by GUTcert GmbH (verification certificate dated October 16, 2023, for audit report no. C-23-24992).

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HZB opted for the **operational control** approach for consolidating data collection and GHG emissions reporting. Under this consolidation approach to a GHG balance data collection, emissions from all included locations are 100% attributed to HZB.
Accordingly, the GHG report accounts for emissions from the following sites:

- Lise Meitner Campus (LMC) in Berlin-Wannsee
- Wilhelm Conrad Röntgen Campus (WCRC) with BESSY II in Berlin-Adlershof

Additionally, the energy consumption and the users' associated greenhouse gas emissions of the Central Agency for Radioactive Waste of the State of Berlin (ZRA) and the Charité Eye Tumour Therapy (ATT) at the LMC are allocated to HZB, as illustrated in Figure 1.

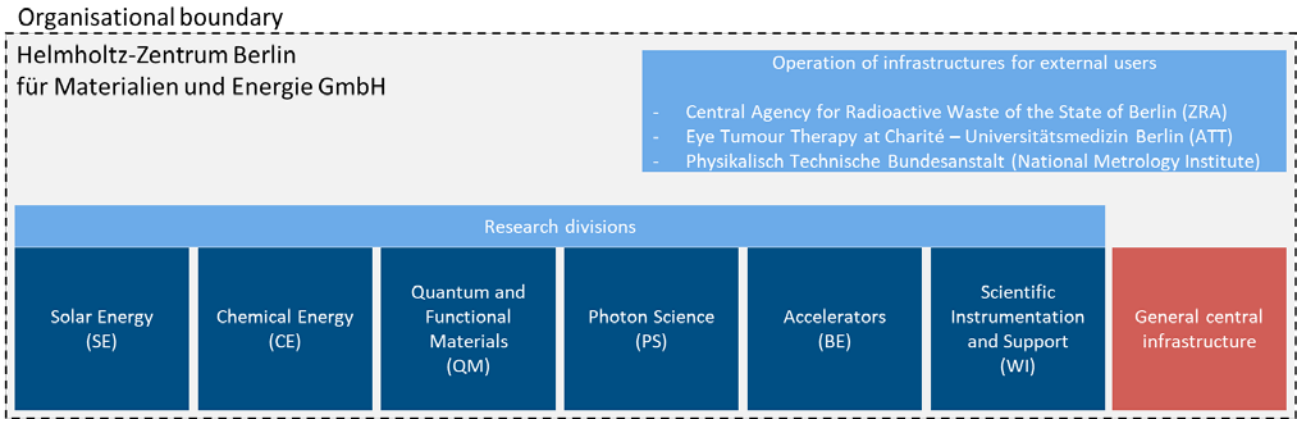

Figure 1: Organisational boundary GHG balance HZB

Data collection took place between November 2022 and June 2023 – with the involvement of all departments and research areas. The greenhouse gas balance was completed on 27 September 2023.

2. EMISSIONS

The GHG protocol defines the following three scopes for the GHG balance data collection:

- Scope 1: Direct GHG emissions from combustion in own facilities (e.g., fuel-powered vehicles and emergency generators), refrigerant leaks (e.g., from refrigerators and cooling systems), and direct process emissions (e.g., technical gases, fire extinguisher leakage testing).
- Scope 2: Indirect GHG emissions from purchased energy (electricity, district heating, local heating).
- Scope 3: Indirect emissions from upstream and downstream activities in the value chain.

For HZB, the following Scope 3 categories and emissions were considered. Other categories were deemed either irrelevant or insignificant based on the materiality assessment (see Section 3 Results).

Table 1: Scope 3 – essential/relevant categories for HZB

Category	Description	Relevance to GHG balance HZB
1	Purchased goods and services	Liquid nitrogen or argon, media supply rentals, purchase of liquid helium Purchase of software Purchase of firefighting equipment
2	Capital goods	Purchase of IT goods Purchase of scientific facilities Purchase of operational equipment Purchase/construction of buildings
3	Fuel- and energy-related emissions	Upstream emissions of fuels (diesel/petrol) Upstream emissions for electricity (green electricity, BTB electricity), upstream emissions for district heating LMC and district heating WCRC (BTB) are considered under Scope 2
5	Waste generation	Waste generation LMC/WCRC (excluding hazardous waste)
6	Business travel	Business travel using various modes of transportation
7	Emps. commuting	Employee travel to and from work locations
9	Transportation and distribution (downstream)	Arrival and departure of measurement visitors

3. Results

According to the GHG Protocol, two calculation methods must be presented for Scope 2 emissions: the location-based method and the market-based method. In the location-based method, grid-average emissions factors for energy sources are used. In the market-based method, the emissions factors specified by the energy suppliers in their certificates are used. The results presented here reflect the market-based method.

Materiality assessment Categories that are deemed material must be considered in the GHG balance sheet according to the GHG Protocol. HZB establishes the materiality criterion that all Scope 3 categories contributing less than 1% of total emissions may be excluded from the GHG balance sheet. An exception is the business travel category , which, due to internal goals, is not excluded from the GHG balance. For Scope 1, categories falling below the 1% threshold are still considered, as reporting is mandatory.

The following table shows the results in metric tons of CO2e and as percentages for the HZB for the year 2021. The emissions total is **9,894.5 metric tons of CO2e**.

Table 2: Total results GHG balance HZB

		Name	t CO_2e	%
S1		Stationary facility	16.5	0.2
S1		Company vehicles	10.2	0.1
S1		Refrigerant leaks from cooling systems	68.7	0.7
S1		Refrigerant leaks from refrigerators	0.4	0.0
S1		Direct emissions technical gases	6.7	0.1
S1		Direct emissions fire extinguishers	0.0	0.0
S2		Electricity	701.3	7.1
S2		District and local heating	3,714.1	37.5
S3	K1.1	Purchase of gases	401.8	4.1
S3	K1.5	Purchase of firefighting equipment	264.3	2.7
S3	K2.1.1	General construction	330.8	3.3
S3	K2.1.2	Construction of new buildings	1,134.9	11.5
S3	K2.2	Purchase of scientific facilities	1,132.0	11.4
S3	K2.3	Purchase of IT goods	241.3	2.4
S3	K2.4	Purchase of operational equipment	520.7	5.3
S3	K3	Fuel- and energy-related emissions	209.2	2.1

		Name	t CO_2e	%
S3	K5.2	Waste generation (excluding hazardous waste)	125.6	1.3
S3	K6	Business travel	21.7	0.2
S3	K7.1	Employee commuting	699.1	7.1
S3	K9	Measurement visitors	295.1	3.0
		Total Scope 1	102.6	1.0
		Total Scope 2	4,415.4	44.6
		Total Scope 3	5,376.5	54.3
		Total (market-based method)	**9,894.5**	**100.0**

The breakdown by scopes and the breakdown within Scope 3 by categories are shown in *Figure* 2 and *Figure* 3, respectively.

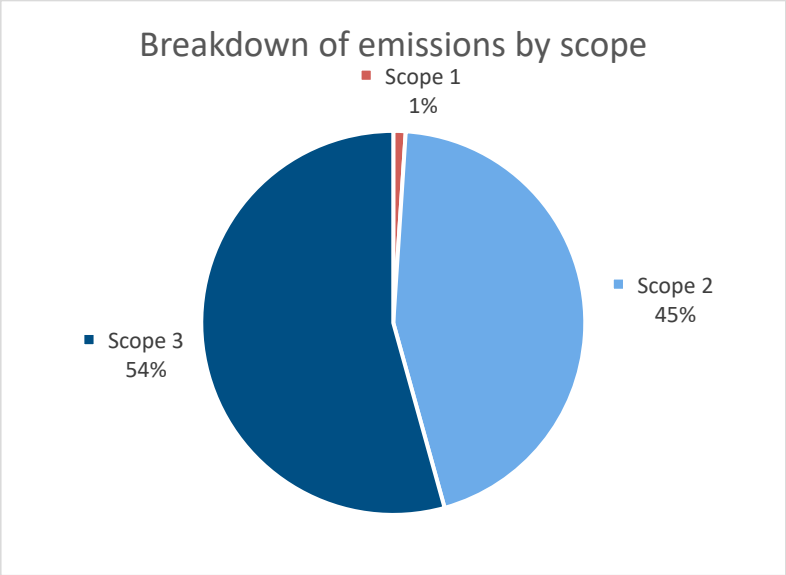

Figure 2: Breakdown of total emissions by scopes

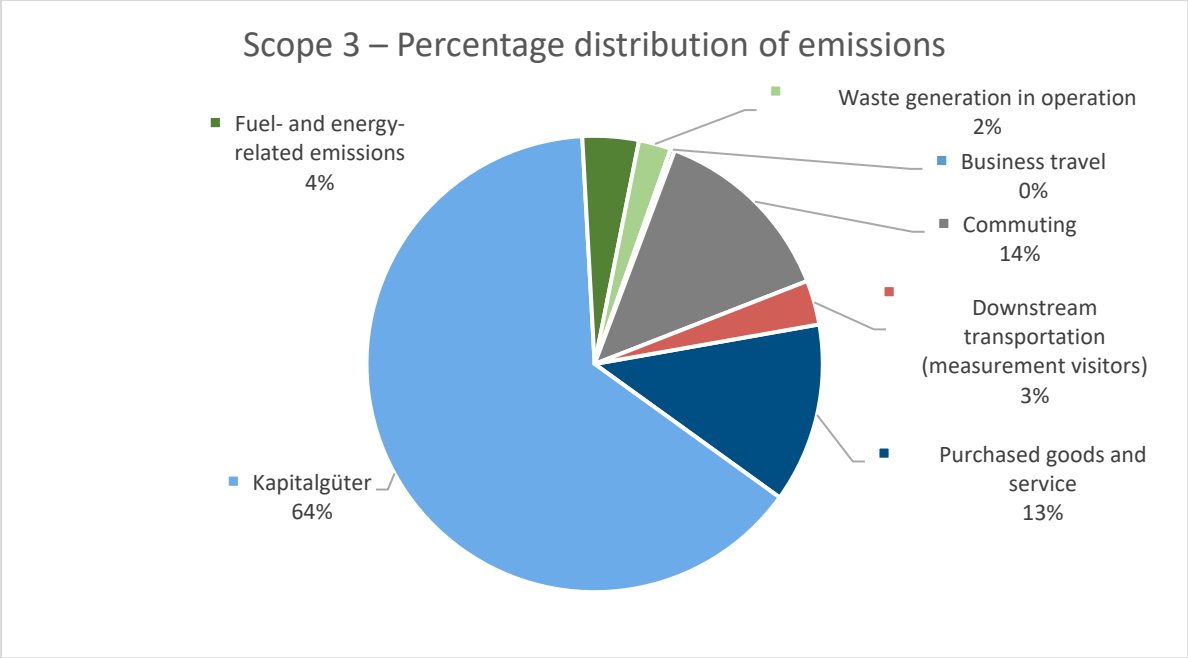

Figure 3: Scope 3 – Percentage distribution of emissions

The category of capital goods is responsible for the largest share of emissions within Scope 3, accounting for 64%. This category includes construction as well as the purchase of scientific facilities and the purchase of operational equipment.

The total emissions from HZB activities for the year 2021 are equivalent to the average annual emissions of 883 people in Germany (assuming 11.2 t CO2e per person).[1] The emissions amount to **7.8 t CO2e per employee** (HZB employees in 2021: 1,264).[2]

The largest emitters (emissions greater than 500 tons) are summarised in the following graph:

[1] Source: Umweltbundesamt, Konsum und Umwelt: Zentrale Handlungsfelder, available at: https://www.umweltbundesamt.de/themen/wirtschaft-konsum/konsum-umwelt-zentrale-handlungsfelder/klimaneutral-leben-verbraucher-starten-durch-beim%20-%20textpart-2#bedarfsfelder, last accessed on 25 April 2023.

[2] Note: The comparability with other institutions is limited, as the results depend on the data basis, the calculation method, and the relevant categories.

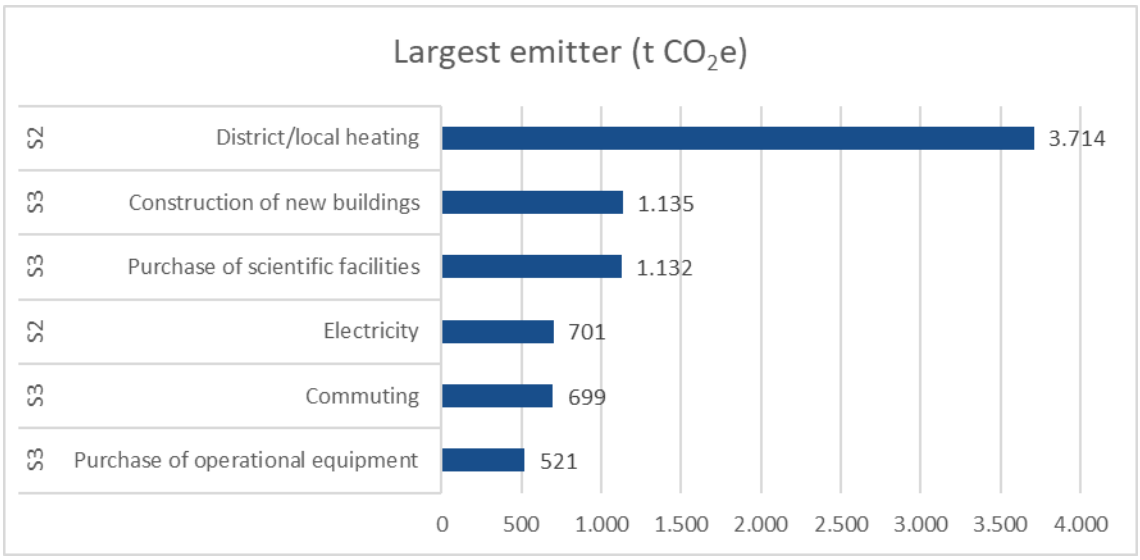

Figure 4: Largest emitter (> 500 tons CO_2e) of the GHG balance

The largest potential for emission reductions lies in these categories.

4. Outlook

Extensive organisational and technical measures for climate protection have already been implemented. As a result of the greenhouse gas balance, areas of action for operations, construction and research have been developed, focusing on reducing the GHG emissions of the main emitters.
The GHG balance serves as the basis for developing a climate protection concept, which includes the identification of reduction potentials and measures to achieve the HZB's goal of becoming greenhouse gas neutral by 2035.

LIST OF ABBREVIATIONS

ATT	Eye Tumour Therapy at Charité – Universitätsmedizin Berlin
BEA	Berliner Energieagentur GmbH
BESSY	Berlin Electron Storage Ring for Synchrotron Radiation
CO_2e	CO_2-equivalent
GHG	Greenhouse gas
HZB	Helmholz-Zentrum Berlin für Materialien und Energie GmbH
LMC	Lise Meitner Campus
Emps.	Employees
PTB	Physikalisch Technische Bundesanstalt (National Metrology Institute)
GHG	Greenhouse gases
WCRC	Wilhelm Conrad Röntgen Campus
ZRA	Central Agency for Radioactive Waste of the State of Berlin